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Kumaun. Working plan of the Nindhaun Hills working Circle, Kumaun Forest Division, N.W.P and Oudh, 1886

A: Govt. of India

Sub: Forest/Kumaun Division/working ~~place~~ plans/United provinces/India/1886

speculators to enter into contracts for sleepers, and in order to secure a certain favorite area for themselves, these men were allowed, unchecked, to cut down acres of old trees, very far in excess of what they could possibly export ; so that for some years after the regular forest operations commenced, the attention of the department was chiefly directed to cutting up and bringing to depôt the dead timber left behind by the contractors.

Major (now General) Ramsay was the first Conservator. He abolished the contract system in 1858, and gradually introduced a better arrangement by which the cultivation of patches of land in the forest proper was discouraged, and the cultivators were induced to take up lands chiefly south of the Kandi sarak.

In his report for 1867 the Commissioner writes :—"As yet cattle have not in all cases been excluded from the tracts recently made over to the Forest Department, because some time must be allowed to the villagers to make other arrangements, but a great many cattle-sheds have been removed from the vicinity of the sál forests of the outer range between Haldwáni and the Sarda river." The same officer introduced the system of having all trees marked by responsible officers before permission was given for felling, and, on the whole, the administration of the forest was a marked success, there being a surplus of nearly seven lakhs in this division from 1859 to 1868.

In the latter year Major Pearson took charge as Conservator, but made little change in the working arrangements.

6 In 1877 the reserved forests in the Kumaun Bhábar were formally demarcated and 11 blocks were formed. The present working circle contains all the forests closed to rights in Block VI, with the exception chiefly of the forests between the Nindhaur ridge and the plains as already stated. The lower slopes and more accessible areas have been worked out by contractors, still there is a larger area of unworked sál forest in this block than in any other of the Kumaun Bhábar.

CHAPTER II.

Configuration of the ground.

7. The working circle consists of a portion of the so-called Bhábar forests of East Kumaun, covering an area of about 90 square miles of hilly ground, made up as follows :—

	Acres.
Jariakhal	2,315
Barmdeo	3,357
Chini basin (hilly part)	7,640
Kalaunia basin (do.)	18,884
Nindhaur ditto (do.)	25,400
Total ...	57,596

8. The Jariakhal forest is situated on the right bank of the Sarda in the extreme east bordering on Nepal. The lower portion is a plateau everywhere furrowed by a number of nalas which are usually dry, and the upper half consists of hilly ground usually steep and frequently scarped and precipitous. The most common aspects are south-east, south-west, and west.

9. The Barmdeo forest is situated immediately above Barmdeo itself, and consists of a gently sloping undulating plateau bordered on the north by hilly ground, a little of which is included in the reserve, and on the other three sides by short usually precipitious slopes; the plateau is traversed by several nalas similar to those in Jariakhal.

10. That portion of the Chini basin included in the working circle consists almost entirely of hilly ground ; the upper portions are very steep and precipitous, scarps, precipices, and landslips being common everywhere ; but lower down the ground is

less broken, whilst there is some flat land here and there along the banks of the main stream, compartment XV, 444 acres in extent, consisting entirely of a long narrow plateau. The most common aspects are south and south-east.

11. That part of the Kalaunia basin included within our limits is very similar in character to the preceding one, the upper compartments of its main tributaries, as far as the great bend to the west, generally consisting of precipitous and scarped ground, as is also the case for the slopes which drain directly into the main stream, but the lower slopes are moderate, and there is some flat ground in the south along the Morchakhola and the lower part of the Dula Gad. After its great bend to the west the Kalaunia becomes known as the Sarra nadi, and here, on the south bank, the slopes are precipitous towards the main ridge, whilst there are some gentler slopes near the nadi as well as a few chaors; on the northern bank moderate slopes may be said on the whole to preponderate, and chaors are common, the precipitous ground lying chiefly to the east of the Raula Khola, especially towards the upper boundary, which in places has an altitude of over 3,700 feet.

12. In the Nindhaur valley the ground is often very rugged and frequently precipitous, especially in the upper parts of the basins of the small streams and along their banks; scarps and landslips are not uncommon, but the gradient is constantly changing, every possible slope being met with in each compartment. In Balot South the slopes however are usually gentle or moderate. There are several small chaors, especially near the Nindhaur itself and bordering on the river are in places some flats such as those of Kholgarh and Khonani. In the south of the Gaunia Rao block there is a peculiar isolated hill with rather steep slopes, and in the Bhalsani block the main stream in its upper course passes through a narrow gorge with precipitous sides and waterfalls. The main aspects in the valley are north and south.

CHAPTER III.

Rock and Soil.

13. The whole of the hills in the circle belong geologically to the Sub-Himalayan system and are therefore of tertiary age, and from Naini Tal to the Sarda the sandstone ridge that represents the Siwaliks is so close to the Himalaya that the geologist alone can discern the connection. The Dúns are here reduced to deep longitudinal gorges and low gaps, corresponding with a leading geological boundary, that between the old slaty and schistose rocks of the mountains and the massive tertiary sandstones of the Siwaliks.

14. In the Jariakhal forest the plateau is formed of a sandy alluvium with layers of clay tilted up to an angle of 20°, apparently excellent for sál, and the hilly ground is formed of sandstone and quartzite, the soil being usually superficial.

15. In the Barmdeo reserve the Khamari Khapkot and Dangaona blocks are formed of an alluvial deposit, the upper layers of which are more porous than the lower ones, which contain a large proportion of clay and overlie a sandy bluish marl easily disintegrated. The thickness of the alluvium varies from 10 to 100 feet, and on the higher parts of the plateau it is often covered with sandstone boulders; on the hilly ground there is the usual sandstone rock. In the Bansa and Naghan blocks the underlying rock is a rough gritty sandstone evidently of Siwalik formation, and the soil is mainly derived from its disintegration, fragments of the rock being found everywhere; it is fairly deep and permeable. In Bansa 3 there is a stratum of iron ore (red hematite) cropping out near the foot of the hills.

16. In the Chini basin the hills are mainly formed of alternate layers of sandstone, quartzite, and marl, the soil being dry, superficial, and stony on the precipitous slopes, somewhat better on the more moderate ones; the marl outcrops in one place, and ferruginous sandstone is found in Chini 33 and 34, whilst there is good alluvium in Chini 15.

17. In the basin of the Kalaunia, as far as its great bend to the west, the upper precipitous parts are composed of a sandstone rock often exposed or superficially covered with a sandy soil, whilst lower down there is marl and sandstone, the soil being frequently loamy. On the flat parts there is usually a loose alluvium, often deep and well-suited to sál where the drainage is good. In the upper part of the Kalaunia, here called the Sarra nadi, there is the usual sandstone on the higher ridges, but lower down a conglomerate occurs consisting of clayey sand mixed with innumerable pebbles, and an underlying bed of clay cropping out near the nadi. This formation reaches the ridge towards the source of the stream forming the watershed line between it and the Nindhaur. The soil is, as a rule, moist and loamy on the right bank of the stream.

18. In the Nindhaur valley there is generally the usual soft friable crumbling sandstone covered by a dry superficial soil which is not uncommonly completely absent, exposing the bare sandstone rock, and large areas are thus unproductive as in parts of Kholgarh (south), but there is a fair sandy loam in places as in the Silani block and in portions of other blocks on the more moderate slopes, where the soil is moister and deeper and often mixed with rock debris or covered with loose rolling stones and with boulders as in Aonla Khera (north). The isolated hill in the Gaunia Rau block has in a great many places a deep or even very deep soil, excellent for sál. In the east part of the Durga Pipal block there is a conglomerate which is a continuation of that described as occurring in the valley of the Sarra nadi, and like it overlies a band of clay which crops out at the surface, only near the bottom of the slopes; alluvium is usually present on the chaors and flats near the river, and on some of the lower and gentler slopes in the Gaunia Rau and South Kholgarh blocks; this alluvium is fairly deep on the flats, but rather shallow on the chaors and slopes where it is occasionally mixed with pebbles. There is a fine silt on the low plateau in the Durga Pipal block.

CHAPTER IV.

Climate.

19. There is the usual alternation of the seasons—the cold, the hot and the rainy. At the beginning of the cold weather the sky is generally clear, winds are not frequent, whilst the range of temperature is exceptionally great and heavy dews fall at night. In December and January, owing to the frequent presence of clouds, the daily range of temperature is less than in November. Some rain usually falls about this time, and from the middle of March and throughout April the temperature rapidly rises and continues rising until the rains arrive; the air becomes drier and in May the grass has all dried up and nearly all the open forests are burnt, although parts of the Nindhaur and Sarra valleys frequently escape. The rains usually set in by the beginning of July and end at the beginning of October, with one or more breaks in the interval.

20. *Temperature.*—The thermometer in these forests ranges from 30° to 105° in the shade, the mean monthly temperature at the foot of the hills being lowest in January when it is about 58° and highest in June when it is about 88°, the annual mean being about 72°. It is probably less by 3° for every 1,000 feet in elevation as far as the altitudes of the working circle are concerned.

21. *Winds*—Speaking of Kumaun, General Strachey says that, at most seasons of the year on the Himalayan slopes, winds blow up from the valleys during the day, that is from about 9 A. M. to 9 P. M., being strongest in April, May, and June, and down them during the corresponding hours of the night, blowing down the main streams into the plains with great violence. In the working circle these night winds are especially strong in the Sarda valley during the cold weather, and strike full on portions of the Jhariakhal and Barmdeo reserves, probably to the detriment of the growing stock. The usual change of wind takes place at the setting in of the monsoon.

22. *Humidity.*—Taking the vapor tension at sea level as 1, the following figures represent the tension for Kumaun up to 5,000 feet :—

1,000 feet	...	...	...	·92
2,000 „	...	...	...	·89
3,000 „	...	...	...	·87
4,000 „	...	...	...	·74
5,000 „	...	...	...	·64

The maximum degree of humidity is reached in August, whilst the air is driest in April and November. The approximate mean humidity is probably about 70.

23. *Rainfall.*—The average rainfall for 17 years of Kilpuri and Haldwani, the nearest stations to the working circle, is as below :—

Station.	Elevation in feet	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Kilpuri ...	800	1·32	1·72	0·84	0·56	1·35	8·08	19·86	15·63	8·79	1·46	0·01	0·50	60·12
Haldwani ...	1430	1·40	3·18	1·78	0·79	1·32	10·61	21·74	20·67	10·51	1·45	...	0·61	74·06

From this table it is seen that the greatest rainfall is in July and August, whilst rain scarcely ever falls in November. The rainfall increases until an elevation of 4,000 feet is reached, and the probable average rainfall on exposed southerly slopes is—

At 1,000 feet	...	...	60 inches.
„ 2,000 „	...	...	125 „
„ 3,000 „	...	...	159 „
„ 4,000 „	...	...	164 „
„ 5,000 „	...	...	149 „

The heavy rain on the outer hills at the break up of the monsoon is probably due to the minor storms of a cyclonic character that are frequently formed near the head of the Bay of Bengal at the turn of the season, and pass inland in a north-westerly direction.

24. The Nindhaur valley and the upper reaches of the Kalaunia nadi are very damp, and during the cold season a heavy dew falls all night, dripping from the trees like a shower of rain. This continues until the middle of March, and the forest consequently remains green until the latter part of April, which makes the dangerous time for fires a short one, although at the same time it greatly retards the satisfactory burning of the fire-lines. Owing probably to this dampness the Nindhaur valley, and in fact all parts of the working circle, are very unhealthly, and sickness is prevalent at all times. After the end of March or middle of April until November no one will work there, and all except those who have become acclimatised leave the forests, which remain practically closed during the rains, when rank vegetation springs up with surprising rapidity, whilst the hill streams become torrents frequently impassable for several days. To persons who are not acclimatised a single night's residence at this season of the year is not uncommonly fatal, as the malarious fever which is then prevalent is of a particularly malignant type.

CHAPTER V.

The Stock.

25. In the Jariakhal forest on the plateau there is a good forest of sál of all ages from 60 to 80 feet high, and occasionally with a girth of 10 to 12 feet, largely mixed with other species such as Katbhilawa, Bhilawa, Domsal, &c., and in Jhariakhal (south) 3 and 4, there is chiefly a sál pole forest with a number of large trees, and with

a few chír along the precipitous edge. There are several open places and patches with mixed forest which predominates in the east part (Singar-jala), where there is some sál only along the western edge. On the hilly ground there is usually a very open forest of Bakli, Sandan, and some poor Sain, with a good proportion of Kat-bhilawa, whilst some Chír, usually with twisted fibre, covers the crests and ridges. In the deep sots there is a dense forest of mixed species, Saonjna, Phœbe, &c., with numerous climbers especially Vines and Cæsalpinia. Kat-bhilawa is common in many places with a western aspect, associated with some Sál, Sandan, and Sain, whilst on the lowest slopes at the same aspect there is a Sál pole forest.

26. In the Barmdeo reserve, on the plateau in the Khapkot, Bansa and Naghan blocks, and in the lower parts of Khamari 1 and 2, there is mainly a Sál pole forest, the Sál being mixed with a few other species such as Sain, Haldu, Bakli, Dhaura, Bijasal, &c., and occasionally numerous stunted Kat-bhilawa, together with some inferior Bamboos. The Sál poles, although of a naturally vigorous growth, have been injured at the base by frequent forest fires. There are only a few large trees and these are generally unsound ; but that Sál is here capable of attaining large dimensions is proved by the fact that some trees over 12 feet in girth were measured in the Bansa block. Sál also covers a large part of the hilly ground except on westerly aspects.

Patches of mixed forest occur here and there in the midst of the Sal, containing such species as Sain, Khair, Haldu, Gosam, Saonjna, Bahera, Domsal, Jhingan, Grewias, &c., and there are occasional large blanks with a few scattered trees, such as Figs, Rauni, Bakli, Dhaura, Dhák, Chilla, Paiman, &c. Mixed forest predominates in the Khamari block, in Bansa 5, Naghan 1, and Naghan 5 (west part), whilst in the Dangaona block the forest is essentially one of Haldu and Bamboos, mixed with numerous other species such as Semal, Kaim, Lesora, Amaltas, Doldhak, and a few Khair in places. On the western slopes of the hilly ground there is chiefly Bakli, Dhaura, Sain, Siris, Katbhilawa, &c On the flat strip in the Khapkot block there is a mixed forest of Khair, Shisham, Siris, &c., and on the islands a mixed forest of Shisham, Khair, Sain, Siris, Ambara, &c., but in some places there are only Shisham and Papri (Ulmus integrifolia).

Bamboos are common but their quality is inferior, the best being found in the Dangaona block.

27. In the Chini basin there is ordinarily an open mixed forest of Bakli, Sain, and Sandan, with numerous Kokat on the more exposed slopes of the upper precipitous portion, whilst in more favorable situations there is in addition some inferior crooked Sál, Katbhilawa, &c., and on the higher ridges are a few Chír.

On the more moderate slopes there is frequently a sál pole forest, often of vigorous growth, but somewhat injured by fires, with Sain in patches, and often numerous Katbhilawa, Bhilawa, and sometimes Bakli. Large trees are usually rare, but that Sál can attain a large size in places is shown by the measurement of a tree over 12 feet in girth in Chini 9. Some of the flat ground formed of clayey alluvium is covered with Kokat or with grass and scattered trees only. Bamboos are common nearly everywhere, becoming scattered near the higher ridges and on exposed slopes ; there are some dead clumps of Bambusa arundinacea along the lower course of Gonya Gad.

28. In the Kalaunia basin on the higher and more precipitous parts there is, as a rule, an open forest of Sain, Bakli, and Sandan with some Sál and Kokat, and Chír on the highest parts, or on somewhat more favorable aspects an indifferent mixed forest of Sál and Sain with some Kat-bhilawa, Sandan, Bakli, &c. Mixed Sál forest predominates on either bank of the Sarra nadi, and on many of the more moderate slopes lower down the Kalaunia. In this type of forest we find associated with Sál some Sain, Bakli, Sandan, Katbhilawa, and other Kokat. The Sál and Sain are often crooked and stunted, but some good areas are occasionally met with, *e.g.*, most of the chaors along the Sarra. Chír occupies the higher ridges, and is especially abundant

in Sarra South, there being a very fine Chír forest in the extreme west of that block. In Kalaunia east and west, and in the Dula Gad block, there is frequently a Sál pole forest on the more moderate slopes, especially in the lower parts, where the sál is sometimes almost pure, sometimes mixed with a variable quantity of Katbhilawa, Bhilawa, Bakli, Sandan, Dhaura, Kókat, and a few Sain. The stock is very full in the lower part of the Banjaria sot where the Sál poles are often 40 to 100 feet high and fairly well-grown. There are also some good areas covered with Sál poles in Sarra (north) as in compartment IV towards the top of the basin, where the poles are straight and frequently over 100 feet high. Bakli trees are particularly numerous and fine in the neighborhood of the Raula Khola.

In some of the more precipitous places the ground is either bare or covered with a few Acacia eburnea, some small Bakli, Sandan, and Sain, whilst Wendlandia is helping to cover some recent landslips. The islands and the low lying ground along the Kalaunia, especially in its upper reaches, usually contain Khair and Shisham or sometimes a mixed forest.

Bamboos are on the whole plentiful and of good quality, except in the upper portion of the Sarra nadi, in the Dula Gad, and in the dense Sál pole forests of the lower slopes.

29. In the Nindhaur valley the usual stock is a mixed Sál forest containing generally Sain and Bamboos, with a variable proportion of other species such as Kat-bhilawa, Bhilawa, Bakli, Sandan, &c., and with a sprinkling of Chír in the higher parts, especially along the crests of spurs and ridges. Aonla Khera south is remarkable for the almost total absence of Sál saplings and young poles, but the proportion of Sál to other species is unusually high, varying from 1 : 2 to 1 : 4, whereas elsewhere it varies from 1 : 5 to 1 : 10, except on the isolated hill in the Gaunia Rau block where about one-half the stock is Sál. In the Durga Pipal block Chír usually predominates, Sál and Chír being in the proportion of from 1 : 2 to 1 : 5, save in the pole forest in compartment VIII, where the number of the former is to that of the latter as 4 : 1. On the right bank of the Aonla Khera Gad the trees are chiefly Sál and Sain of the younger classes with a large quantity of Bamboos, and there is also an excellent young Sál forest on the same bank of the Dwarmial Gad, omitting the precipitous portions, whilst in the same block, Balot North, on the slopes over the Nindhaur there is a young mixed Sál forest, that species being to all the others in the proportion of from 1 : 10 to 1 : 5. On the left bank of the Aonla Khera Gad, and on the right bank of the Gaunia Rau, there is frequently a Sál and Sain pole forest of variable age containing also a few Katbhilawa, Sandan, &c., and a little Chír on the high ridges. In the upper portion of Balot (south) there is a young crop of Sál well mixed with Sain, the trees being nearly all of the fourth class, whilst in the two lowest compartments there is advanced growth of Sál at the top of the slopes and very young poles at the bottom ; there is also in many parts of Kholgarh North a Sál pole forest of variable age, with some big trees interspersed, and often associated with Katbhilawa, Sandan, &c. The dry precipitous upper portions of the various basins, especially on unfavorable aspects, are not unfrequently bare or partially covered with a few shrubby Acacia eburnea, or they contain a very open poor forest of Bakli, Sandan, &c, and Bamboos, sometimes also a little Sál and Sain. Banj occurs from about 4,000 feet in Kholgarh north 5.

The flats along the river are principally open grass lands, *e.g.*, those in Durga Pipal 7, Kholgarh South 3, Kholgarh chaor and in Khonani South, but in Kholgarh North there is a nearly pure Bamboo forest on the flat, containing however some Sál near the slopes, although grassy blanks are not uncommon, whilst similar ground in Khonani North is well stocked with fine Sal above the road and below also in places, but here there are grassy blanks.

Shisham and Khair occur along the banks and on the islands of the Nindhaur, especially in the upper reaches of the river ; thus in the lower part of Durga Pipal 6

there is a dense growth of promising young Shisham poles mixed with other species, and in Kholgarh South 9, there is rather a good forest of Shisham and Khair along the river bank. Bamboos are common throughout the valley.

30. I am indebted to Mr. Fernandez for the following list of the more important forest plants of the Nindhaur valley, and with a few additions of my own it may be considered as applicable to the whole of the working circle :—

Order.	Scientific names.		*Vernacular names.* Kumauni.	Garhwáli.	Remarks.
Anonaceæ ...	Miliusa velutina ...	T.	Daulo ...	Gousál ...	Rare.
Menispermaceæ ...	Cocculus laurifolius ...	T.	Tilpora ...	Tilpara ...	Common in places.
Bixineæ ...	Flacourtia Ramontchi ...	S.	Kala ...	Bila gura ...	In low kokat forest.
Pitosporeæ ...	Pittosporum floribundum,	S.	Raini ...	Tumri ...	Not common as a rule.
Terustrœmiaceæ ...	Saurauja nepalensis ...	T.	Gogan ...	Gogani ...	Pretty common.
Dipterocarpeæ ...	Shorea robusta ...	T.	Sál ...	Sal ...	Very abundant.
Malvaceæ ...	Kydia calycina ...	T.	Patha ...	Pulo ...	In kokat forest chiefly.
„ ...	Bombax malabaricum ...	T.	Semul ...	Semul ...	Not common.
Sterculiaceæ ...	Sterculia villosa ...	T.	Odal ...	Odala ...	Occasionally on dry rocky hills.
„ ...	„ colorata ...	T.	Bodal ...	„ ...	...
„ ...	Helicteres Isora ...	S.	Darpata ...	Mod ...	Fairly common.
Tiliaceæ ..	Grewia oppositifolia ...	T.	Bhimal ...	Bhimal ...	Particularly common in parts of the Barmdeo forest.
„ ...	„ tiliæfolia ...	T.	Pharsiya ...	Pharsai ...	
„ ...	„ lævigata ...	T.	Dali bhimal...	Dal miúl ...	
Lineæ ...	Reinwardtia trigyna ...	S.	...	...	Abundant in higher parts.
Malphigiaceæ ...	Higtage madablota ...	C.	Bándo ...	Bánda ...	...
Rutaceæ ...	Murraya exotica ...	S.	Merchi ...	Mersola ...	Common in low kokat forest.
„ ...	„ kœnigii ...	S.	Gunti ...	Gondela ...	...
„ ...	Citrus medica ...	S.	Banbijora ...	Kat binjora...	Occasionally gregarious around marshes.
„ ...	„ Aurantium ...	S.	Jairum ...	Jaumera, Jamera.	
„ ...	Ægle marmelos ...	T.	Bél ...	Bél ...	Sometimes met with in low kokat forest.
Burseraceæ ...	Garuga pinnata ..	T.	Tilmédi ...	Kulmul ...	Not common.
Meliaceæ ...	Heynea trijuga ...	T.	Baurito ...	Balrito ...	Pretty common and near its western limit.
„ ...	Cedrela Toona ...	T.	Túni ...	Tún ...	Not common.
Ilicineæ ...	Ilex odorata ...	T.	Gadéri ...	...	Rare.
Celastrineœ ...	Celastrus paniculatus ...	C.	„ ...	Kond gaidh...	...
„ ...	„ rufus ...	T.	..	...	...
„ ...	Elœodendron glaucum ...	T.	Shauria ..	Daberi ...	Not uncommon.
Rhamneæ ...	Ventilago calyculata ...	C.	Halaudia ...	Balmoga ...	Common in places.
„ ...	Zizyphus jujuba ...	S.	Beri ...	Beri ...	Nowhere abundant.
„ ...	„ nummularia ...	S.	Makedu ...	Jad bér ...	...
„ ...	„ rugosa ...	S.	Ainya ..	Kat bér ...	...
Ampelideæ ...	Vitis tomentosa (new) ...	C.	Aminchi ...	Kat bela ...	Common.
Sapindaceæ ..	Schleichera trijuga ...	T.	Kosum ...	Kosum ...	Pretty common.
„ ...	Acer oblongum ...	T.	Parpat Galiya,	Kirmola ...	On the higher parts only.
Anacardiaceæ ...	Buchanania latifolia ...	T.	Muriá ...	Katbhilawa ...	Very abundant.
„ ...	Odina wodier ...	T.	Jhiganu ...	Jhinghan ...	Common.
„ ...	Semecarpus Anacardium,	T.	Bhaliya ...	Bhilawa ...	Abundant.
„ ...	Spondias Mangefera ..	T.	Amárd ...	Amard ...	Rather rare.
Coriareœ ...	Coriaria nepalensis ...	S.	Ayar ...	Gógsa ...	Common.
Moriugeœ ...	Moringa pterygosperma...	T.	Sejan, Saonjna	Soandal ...	Often associated with shisham, &c.
Leguminosæ ...	Indigofera sp. ...	S.	Sakena ...	Sakena ...	Very common in places.
„ ...	Millettia auriculata ...	C.	Gonjha ...	Goj ...	Common.
„ ...	Ougeinia dalbergioides ...	T.	Sandan ...	Sandal ...	Abundant on precipitous slopes.
„ ...	Erythrina arborescens ...	T.	Ralga ...	Mandara Rangara.	...
„ ...	„ suberosa ...	T.	...	Dauldhák ...	...
„ ...	Spatholobus Roxburghii,	C.	Maulu ...	Malin ...	...
„ ...	Butea frondosa ...	T.	Dhak ...	Dhák ...	Only occurs occasionally.
„ ...	Flemingia sp. ...	S.	Bhodiya ...	Bhadula ...	Common.
„ ...	Dalbergia Sissoo ...	T.	Shisha ...	Sissu ...	Often abundant on river banks.
„ ...	„ volubilis ...	C.	Bhadiya ...	Bhadiya ...	.
„ ...	Pterocarpus marsupium ..	T.	Bijasál, ...	...	Very rare.
„ ...	Cæsalpinia sp. ...	C.	...	...	...
„ ...	Cassia fistula ...	T.	Rajbriksh ...	Símáru ...	Common.

Order.	Scientific names.		*Vernacular names.* Kumauni.	Garhwáli.	Remarks.
Leguminosæ ...	Bauhinia racemosa ...	T.	Amli, Umli...	Umli. ...	
„ ...	„ retusa ...	T.	Kandolo ...	Kandalau ...	
„ ...	„ Vahlii ...	C.	Malu ...	Malu ...	Very abundant.
„ ...	„ purpurea ...	T.	Koirál ...	Goiral ...	Common.
„ ...	Piptadenia oudhensis ...	T.	...	...	Probably found in the working circle.
„ ...	Mimosa rubicaulis ...	C.	Katdad ...	Kora ...	Common.
„ ...	Acacia eburnea ...	S.	Babúl ...	Babúl ...	Abundant on dry very precipitous ground.
„ ...	„ Catechu ...	T.	Khair ...	Khair ...	Abundant along rivers.
„ ...	„ pennata ...	C.	Agla, Main ...	Aglawa, Airaú,	
„ ...	„ Suma ...	T.	Khair ...	Khair ...	
„ ...	„ lenticularis ...	T.	...	...	Common in a few places.
„ ...	Albizzia Lebbek ...	T.	Gokiru ...	Gokra ...	Common occasionally.
„ ...	„ odoratissima ...	T.	...	Konera, Konédu.	
„ ...	„ procera ...	T.	Kalsis ...	Karu ...	
„ ...	„ Julibrissin ...	T.	Barau ...	Siris ...	
„ ...	„ stipulata ...	T.	Shirsha ...	Jingal ...	
Rosaceæ ...	Prunus Puddum ...	T.	...	Paddam ...	On the higher parts.
„ ...	Rubus flavus ...	S.	Aisálu ...	Hisálu, Hisolu,	
„ ...	Rosa moschata ...	S.	Kwia ...	Kúnju ...	
„ ...	Pyrus Pashia ...	T.	Maiul ...	Maiul Mailu...	
Saxifragaceæ ...	Itea nutans ...	T.	Chumli ...	Gaseri Katula,	Rare.
Combretaceæ ...	Terminalia belerica ...	T.	Bainda ...	Bayaro ...	Pretty common.
„ ...	„ Chebula ...	T.	Haira ...	Haira ...	Abundant.
„ ...	„ *tomentosa* ...	T.	Sáj ...	Sein ...	
„ ...	*Anogeissus latifolia* ...	T.	Bakla ...	Dhaura ...	Common especially on S. slopes.
Myrtaceæ ...	Eugenia operculata ...	T.	Rai Jáman ...	Rai Jamona...	Common in damp places.
„ ...	„ Jambolana ...	T.	Jamona ...	Jamal ...	„ „
„ ...	„ sp. ...	T.	Jamowa ..	Dupka, Phalinda.	„ „
„ ...	„ sp. ...	T.	Phunda ...	Phalinda ...	„ „
„ ...	Careya arborea ...	T.	Kumbh ...	Khumbi ...	Not rare.
Lythraceæ ...	Woodfordia floribunda ...	S.	Dhuiya ...	Dhaula ...	On warm steep hillsides.
„ ...	Lagerstrœmia parviflora...	T.	Dhaura ...	Biral dhaura, Baka.	On badly drained clayey lands.
Samydaceæ ...	Casearia graveolens ...	S.	Chilla ...	Narra ...	Fairly common.
„ ...	„ tomentosa ...	T.	„ ...	Chilla ...	Common in kokat forest.
Araliaceæ ..	Heptapleurum vonulosum,	T.	Karboti Semul,	Kúr Semul ...	Common.
„ ...	Heteroponax fragrans ...	T.	Dimna ...	Dimna. ...	
Rubiaceæ ...	Adina cordifolia ...	T.	Huldu ...	Huldu ...	In Barmdeo forest and along foot of the hills.
„ ...	Stephegyne parvifolia ...	T.	Phaldu ...	Keim ...	„ „
„ ...	Hymenodictyon excelsum,	T.	Bauranga ...	Bauranga ...	Scattered in places.
„ ...	Wendlandia exserta ...	T.	Chelitana ...	Posára ...	On broken ground and on old landslips.
„ ...	„ tinctoria ...	T.	Padhera ...	Kat moliya ...	
„ ...	Randia dumetorum ...	S.	Mandeo ...	Mindola ...	In low thick jungle.
„ ...	Gardenia turgida ...	T. or S.	Thúnla ...	Thunera ...	
„ ...	Hyptianthera stricta ...	S.	Aiyar ...	Gadera ...	In damp snady ravines.
„ ...	Pavetta tomentosa ...	S.	Puldu ...	Puldu ...	
„ ...	Hamiltonia swieveolens...	S.	Padhera ...	Padhera ...	On dry slopes.
Myrsineæ ...	Mœsa indica ...	S.	Nana padhera,	...	In damp shady ravines.
„ ...	„ argentea ...	S.	...	...	
„ ...	Myrsine semi-serrata ...	T.	Gaderi ...	Aiwoli ...	„
„ ...	Ardisia humilis ...	S.	Kat kumáli...	Kat kumáli ...	„
Sapotaceæ ...	Bassia butyracea ...	T.	Chiúra ...	Chiúra ...	Common in places.
Styraceæ ...	Symplocos ramosissima ...	T.	Lodh ...	Lodh. ...	
„ ...	„ racemosa ...	T.	...	...	
Oleaceæ ...	Jasminum hirsutum ...	S.	Jai ...	...	
„ ...	„ dispermum ...	S.	Sirmali ...	Sirmali. ...	
„ ...	„ grandiflorum...	S.	Jay ...	Jai, Jambéli...	
„ ...	Nyctanthes Arbortristis,	S.	...	Kúri ...	On dry stony hills.
„ ...	Schrebera suritenioides ...	T.	Padheri ...	Katmat ...	Rare.
„ ...	Olea glandulifera ...	T.	Gainda ...	Gair ...	„
„ ...	Ligustrum robustum ...	T.	Mercha ...	Merchi ...	„
Apocynaceæ ...	Alstonia scholaris ...	T.	Lattionj ...	Lattionj ...	„
„ ...	Holarrhena antidysenterica,	T.	Kurál ...	Kura ...	Common.
„ ...	Vallaris Heynei ...	C.	Dhudi ...	Dhudáli ...	„
„ ...	Wrightia tinctoria ...	T.	Koind ...	Dhudi ...	

Order.	Scientific names.		Vernacular names. Kumauni.	Vernacular names. Garhwáli	Remarks.
Apocynaceæ ...	Wrightia tomentosa ...	T.	Dhudi ..	Dhudali ...	Common in kokat forest.
„ ...	Ichnocarpus frutescens ...	C.	Do. ...	Do. ...	
Asclegriadeæ ...	Marsdenia lucida ...	C.	Do. ...	Do. ...	
Loganiaceæ ...	Buddleia sp. ...	S.	...	...	
Boragineæ ...	Ehretia lævis ...	T.	Kodo ...	Kodo ...	In lower parts.
„ ...	Cordia Myxa ...	T.	Borilu ...	Katula ...	„
Solanaceæ ...	Solanum sp. ...	S.	Tumku ...	Asédu ...	
Bignoniaceæ ...	Oroxylum indicum ...	T.	Pharri ...	Túngla ...	Not common.
„ ...	Steropermum Suaveolens,	T.	Tumri ...	Padal ...	Common.
Acanthaceæ ...	Adhatoda vasica ...	S.	Bashngarus...	...	As undergrowth in Khair forest.
„ ...	Thunbergia coccinea ...	C.	...	...	Occasionally near marshes, &c.
Verbenaceæ ...	Callicarpa arborea ...	T.	Ghiwala ...	Dhaia ...	
„ ...	Premna barbata ...	T.	Againbal ...	Bakrehar ...	
„ ...	Gmelina arborea ...	T.	Khammara, Bationj.	Kúmára ...	
„ ...	Vitex Negundo ...	S.	Shiáli ...	Shiwali ...	
„ ...	Clerodedron infortunatum,	S.	Rhodélu ...	Rhodera ...	
„ ...	Holmskioldia sanguinea,	S.	Kat maniya...	Kat mollu ...	
Laurineæ ...	Çinnamomum Tamala ...	T.	Kikra ...	Dalchini ...	In damp forests.
„ ...	Phœbe lanceolata ...	S.	Kat-kawal ...	Kekra ...	„
„ ...	Machilus odoratis sima ...	T.	Korailo ...	Kaulo ...	„
„ ...	Tetranthera laurifolia ...	T.	Kat-marra ...	Kat-mara ...	„
„ ...	„ monopetala ...	T.	Do. ...	Do. ...	„
Thymelacaæ ...	Wikstrœmia virgata ...	S.	Chaulai ...	Kat-mona ...	
Elœagneæ ...	Elœagnus latifolia ...	S.	Bana, Nidyali, Inglada.	Lohara ...	Found occasionally.
Euphorbiaceæ ...	Excœcaria insignis ...	T.	Khenna ...	Khennu ...	„
„ ...	Mallotus philippinensis ..	S.	Rauno ...	Raulo ...	Abundant in kokat forest.
„ ...	Bischoffia javanica ...	T.	Pun kein ...	Kail ...	Rare.
„ ...	Antidesma diandrum ...	S.	Umli ...	Amli ...	
„ ...	Briedelia montana ...	T.	Kargualia ...	...	
„ ...	„ retusa ...	T.	Kulgaya ...	Gaya ...	
„ ...	Putranjiva Roxburghü ...	T.	Juto ...	...	In low shady mixed forest.
„ ...	Phyllanthus nepalensis ...	T.	Dhair Maba...	Kat-maba ...	In upper parts often mixed with Chir.
„ ...	„ Emblica ...	T.	Aonla ...	Aonla ...	Pretty common.
„ ...	Securinega Leucopyrus ...	S.	Aitun, Aino...	Bairula ...	
Ulmaceæ ...	Ulmus integrifolia ...	T.	Kanju ...	Kanju ...	On low lying ground.
„ ...	Sponia politoria ...	S.	Kharak, Dali mimal.	Jyun ...	
Moraceæ ...	Ficus indica ...	T.	Bâdu ...	Bar ...	
„ ...	„ infectoria ...	T.	...	Pariya ...	
„ ...	„ Wightiana ...	T.	Bandho ...	Phurphuta ...	
„ ...	„ cordifolia ...	T.	Gajiún ...	Parh pipal ...	
„ ...	„ retusa ...	T.	Barri ...	Tot mida ...	
„ ...	„ scandens ...	C.	Bedula ...	Bedula ...	
„ ...	„ Cunia ...	T.	Kunia ...	Kyunlai ...	Common along water courses.
„ ...	„ glomerata ...	T.	Umra ...	Gular, Umra,	„
„ ...	„ Roxburghü ...	T.	Timla ...	Timla ...	
„ ...	„ hispida ...	T.	Jot mida, Chinsira.	Gogsa ...	
„ ...	„ pubigera ...	T.	...	...	Rare.
Artocarpeæ ...	Artocarpus Lakoocha ...	T.	Dhanwala ...	Kat dhau ...	
Urticaceæ ...	Boehmeria rugulosa ...	T.	...	Gainti ...	In the upper portions.
„ ...	„ platyphylla ...	S.	Gargela ...	Kagsa ...	„
„ ...	Debregeasia bicolor ...	S.	Tushára ...	Ginja, Tushara	„
Cupuliferæ ..	Quercus incana ...	T.	Bánj ...	Bánj ...	„
„ ...	„ annulata ...	T.	Paliyat ...	Phalát ...	„
„ ...	Castanopsis tribuloides ...	T.	Katohj ...	Katonj ...	„
Juglandeæ ...	Engelhardtia Colebrookiana.	T.	Bhati mowa,	Gad mowa ...	„
Coniferæ ...	Pinus longifolia ...	T.	Salo ...	Chír ...	„
Palmaceæ ...	Phœnix farinifera ...	S.	Thakal ...	Thakal ...	Common in places.
„ ...	Wallichia denoiflora ...	S.	Garaunsa ...	Laichya ...	„
Smilaceæ ...	Smilax sp. ...	C.	Konkra ali ...	Kukur dára...	
Gramineæ ...	Dendrocalamus strictus ...	...	Bans ...	Bans ...	Very common.
„ ...	Spodiopogon augustifolius,	H.	Bábar ...	Bábar ...	
Cyperaceæ ...	Eriophorum comosum ...	H.	Do. ...	Bábar ...	

In this list T. stands for tree.

S. „ shrub.

C. „ climber.

P. „ parasite.

H. „ herb.

31. *Aspect.*—The slopes with a northerly aspect are mostly moist and shady, so much so as to injuriously affect the growth of young Sál, and many seedlings appear to be killed down by excess of moisture during the rains; in fact its general appearance on that slope shows that the conditions for its natural reproduction were less favorable than on the warmer and drier slopes with a southerly aspect. In the valley of the Sarra nadi on the right and left banks facing mainly north and south the number of Sál to the acre is respectively 14·8 and 37·8 or 23 trees per acre in favor of the southerly slopes. It should be mentioned, however, that the comparison is more unfavorable to the northern slope than appears at first sight, owing to the fact that the proportion of Chír is greater, and the elevation of certain points somewhat higher than any on the opposite bank. The great moisture in Sarra South is indicated by the abundance of epiphytical orchids and of climbing arums. The more precipitous slopes facing south are usually clothed with a poor open forest of Bakli, Sandan, Sain, &c.

The proportion of Sain to Sál increases directly with increasing moisture and a larger proportion of clay in the soil, so that we find the former species comparatively more abundant on northern slopes and on clayey soil, but it is also found in a stunted condition associated with Bakli and Sandan on the more precipitous parts of the forest.

32. *Altitude.*—The altitude varying as it does from 1,000 to 4,760 feet, the vegetation necessarily changes also, so that whilst in the lowest parts such species as Dhák, Chilla and Ambara are found, on the highest ridges there are Chír, Banj, and other species of a more temperate climate. Sál, however, is found at all elevations except on the highest ridges, but towards its upper limit becomes crooked and stunted, losing its usual vigorous appearance, whilst a large percentage of the trees are unsound.

33. *Quality.*—There are very few really fine trees either of Sál or Sain, the quality varying from 1 to 7 and being on the average from 3 to 6. In the Barmdeo reserve most of the large trees have been cut away, and the few that remain are, as a rule, of very indifferent quality, 2 or 3 to 5. In some parts of the Nindhaur as in Aonla Khera South, Chila, and Kholgarh the quality of the large trees is often only from 1 to 3, but in most places in the valley the first class trees, although only yielding about 40 cubic feet of timber, are usually very sound. The poles, however, are usually of better quality, varying from 2 to 7, the average being from 5 to 6.

The quality of Sain is usually between 2 and 5, but sometimes it is as high as 7, *e.g.*, in the Naghan block. That of Chír is between 4 and 7, going up to 10 in the extreme west of Sarra South.

34. *Density.*—The density, of course, undergoes every possible variation over such a large area; on the most precipitous parts it is generally 0 to 3; in the mixed forests it is usually 3 to 5; in the mixed Sál forests 3 to 7; the average being 5, and in the Sál pole forests it is 5 to 10, but commonly about 6 or 7. The densest forests of all are the Sál pole forests in the lower part of the Dula Gad as in compartments 25, 34, 35, and 36.

The average density of the forest as far as concerns Sál, Sain, and Chír trees, six inches in diameter and upwards, is given in the following table showing the number of each class to the acre. It will be observed that on the average there are 40 trees to the acre, but if the compartments are taken separately—*vide* appendix B—some striking differences will be apparent; thus in Khapkot 1, it is 4·3 only; in Dangaona 3·44; in Dangaona 4, 1·36; and in Khamari 5, 6 01; whilst in Dula Gad 17, it is 118·09; in Bansa 3, 113·92; in Dula Gad 35, 113·68, and in Chini 33, 113·53. On the whole the figures in the table may be regarded as extremely satisfactory, and the number of the younger classes promises well for the future of the forest, which under proper management will steadily and rapidly increase in value.

Name of Forest or Block.	Number of sál per acre.			Number of Sain per acre.			Number of Chir per acre.			Number of all species per acre.
	I and II classes.	III & IV classes.	Total.	I and II classes.	III & IV classes.	Total.	I and II classes.	III & IV classes.	Total.	
Jariakhal	6·28	38·95	45·23	·27	·37	·64	...	·01	·01	45·88
Barmdeo	1·49	46·04	47·53	·82	1·11	1·93	...	·01	·01	49·47
Chini	3·75	51·27	56·02	1·58	4·10	75·69	·05	·10	·15	61·86
Kalaunia East	2·81	36·23	39·04	1·74	5·43	7·17	·33	·58	·91	47·12
„ West	3·75	18·50	22·25	1·82	5·26	7·08	·35	·47	·82	30·15
Dura Gad	2·97	53·43	56·40	1·42	3·58	5·00	·03	·07	·10	61·50
Sarra North	4·86	32·93	37·79	1·07	2·89	3·96	·14	·69	·83	42·58
„ South	3·60	11·17	14·77	1·19	3·27	4·46	1·82	3·07	4·89	24·12
Nindhaur (right bank) ...	4·04	18·88	22·92	1·94	4·85	6·79	·31	·41	·72	30·43
„ (left bank) ...	5·15	16·50	21·65	1·56	4·14	5·70	·99	1·95	2·94	30·29
The Working Circle	3·92	29·82	33·74	1·52	3·94	5·46	·45	·83	1·28	40·48

35. *Reproduction.*—Reproduction has been much checked and retarded by forest fires, but it is usually better in the sál forests than in the mixed ones, and sál seedlings are more abundant than those of other species. Reproduction is also, as a rule, better on moderate southerly slopes than on the corresponding moister northerly ones, where in many cases it is very backward as in the Chila and South Kholgarh blocks.

Seedlings of the large bamboo (*Bambusa arundinacea*) are common near the Gonya Rau in the Chini block. In the annual report for 1883-84 it is stated that the Nindhaur valley shows great improvement from the effects of fire-conservancy. The slopes on the right bank of the Nindhaur river which face the south are thoroughly well stocked with seedlings; on the left bank reproduction is good on the spurs and dry plateaux, but in the hollows a great many seedlings are killed by excessive moisture.

36. A few particulars will now be given for Sál, which is by far and away the most valuable species, as well as for the other kinds, which it has been considered necessary to include in the enumeration survey, *viz.*, Sain, Chír, Shisham, Khair, and Haldu, which already possess or are likely to possess at no remote date a marketable value.

Sál (Shorea robusta).—Sál is the principal species of the working circle, and is found throughout the forests, except on the very highest points on low-lying flats near the main streams or islands, on very precipitous slopes especially those facing south, and in the patches of mixed forest of inferior species which are occasionally met with. The best Sál forests are found, as a rule, on well-drained chaors and plateaux having a deep light alluvial soil, and as stated under aspect sál is often more abundant and finer on southern slopes than on northern ones, owing to the excessive moistness of the latter. Many particulars concerning this species were given at the beginning of the chapter, and it will suffice here to summarise the results of the valuation survey :—

Name of Forest or Block.	Area valued in acres.	I. Class.		II. Class.		III. Class.	IV. Class.	Total.	Number of Sál trees per acre.
		Sound.	Unsound.	Sound.	Unsound.				
Jariakhal ...	1,100	2,094	419	4,064	334	10,039	32,808	49,758	45
Barmdeo ...	3,357	725	338	3,388	549	27,744	126,803	159,547	47
Chíni ...	6,227	2,992	3,854	10,950	5,562	58,858	261,442	343,658	55
Kalaunia, East and West.	4,695	3,663	1,315	8,317	1,824	34,888	117,321	167,328	35
Dula Gad ...	4,949	1,558	2,546	7,458	3,183	48,476	215,951	279,172	56
Sarra North ...	4,129	4,393	1,856	11,159	2,662	39,675	96,291	150,036	38
Sarra South ...	2,977	3,103	878	5,606	1,140	13,084	20,183	43,994	15
Nindhaur (right bank).	12,413	13,272	3,158	30,221	3,555	92,832	141,579	284,617	23
Nindhaur (left bank).	11,224	14,163	4,145	30,989	5,008	77,836	1,07,394	239,535	21
Total ...	51,071	45,963	18,509	112,152	23,817	403,432	1,119,772	1,723,645	33·7

The average number of Sál to the acre is therefore for old trees (I and II classes) 3·9, for young trees (III and IV. classes) 29·8—the extremes being in the Dula Gad and Sarra South blocks where the numbers are :—

Dula Gad	Old trees	2·6
	Young trees	53·4
Sarra South	Old trees	3·9
	Young trees	11·1

About one-sixth of the II class trees and more than one-fourth of the I class trees are unsound, the number of unsouud trees being greatest in those portions such as the lower compartments of the Chini and Dula Gad blocks, which have been previously worked and from which most of the sound and mature trees have been extracted.

37. *Sain*, (*Terminalia tomentosa*).—Sain, as will be seen by referring to the table of contents, occurs in every compartment, but in variable numbers, according to the nature of the soil, altitude, degree of moisture, &c. Thus it is relatively more abundant than Sál on stiff clayey soils and on northerly slopes where the moisture is excessive for the latter species, although it also occurs, but in this instance, stunted and deformed on precipitous southerly slopes associted with Bakli and Sandan.

The contents of the working circle are as follows :—

Name of Forest Block.	Area valued in acres.	I. Class.		II. Class.		III. Class.	IV. Class.	Total.	No. of Sain trees per acre.
		Sound.	Unsound.	Sound.	Unsound.				
Jariakhal ...	1,100	143	25	129	9	218	190	714	·6
Barmdeo ...	3,357	1,551	37	1,135	31	1,693	2,026	6,473	1·9
Chini ...	6,227	3,924	517	4,816	593	10,428	15,151	35,429	5·7
Kalaunia East and West.	4,695	3,057	412	4,337	493	9,997	15,262	33,558	7·1
Dula Gad ...	4,949	2,777	491	3,284	507	7,186	10,576	24,821	5·
Sarra North ...	4,129	1,878	256	2,037	250	4,133	7,833	16,387	4·
Sarra South ...	2,977	1,136	132	2,018	194	3,957	5,793	13,230	4·4
Nindhaur (right bank.)	12,413	8,236	1,383	12,785	1,633	26,913	33,296	84,246	6·8
Nindhaur (left bank.)	11,224	6,063	784	9,623	1,114	21,077	25,480	64,141	5·7
Total ...	51,071	28,765	4,037	40,164	4,824	85,602	115,607	278,999	5·4

With the exception of the Jhariakhal and Barmdeo forests, Sain will be found to be pretty evenly distributed amongst the various blocks. The proportion of old to young trees is on the average 2·6 to 1, whilst in the case of the former one eleventh of the II class and one-eighth of the I class ones are unsound. The proportion of Sain to Sál is a little less than 1 to 6.

38. *Chir* (*Pinus longifolia*).—This species is usually found occupying the higher ridges and spurs. It is very rare in the Jhariakhal and Barmdeo forests, only a few being found on the precipitous southern edge of the plateau, but it covers a considerable area in the Sarra south, Kholgarh south, and Durga Pipal blocks, where it often forms a pure forest, or is mixed with a variable proportion of Sál and other species. In fact those three blocks contain more than half of the total number of Chír found in the working circle.

The table here given shows the distribution of Chír in the different parts of the circle:—

Name of Forest or Block.	Area valued in acres	I. Class.		II. Class.		III Class.	IV. Class.	Total.	No. of Chír trees per acre.
		Sound.	Unsound.	Sound.	Unsound.				
Jariakhal ...	1,100	...	..	...	...	1	2	3	...
Barmdeo ...	3,357	5	...	,25	...	36	6	72	...
Chini ...	6,227	100	...	241	...	359	285	985	·1
Kalaunia East and West,	4,695	611	...	986	...	1,397	1,191	4,185	·9
Dula Gad ...	4,949	47	...	143	...	197	181	568	·1
Sarra North ...	4,129	123	...	468	...	1,317	1,541	3,449	·8
Sarra South ...	2,917	1,847	81	3,501	...	4,892	4,273	14,594	4·9
Nindhaur (right bank),	12,413	1,865	1	2,004	...	2,713	2,437	9,020	·7
Nindhaur (left bank),	11,224	4,027	2	7,066	1	11,067	10,777	32,940	2·9
Total ...	51,071	8,625	84	14,434	1	21,979	20,693	65,816	1·3

The proportion of old trees to young is as high as 1 to 1·9, but this may be in a great measure due to the Chír areas having never been worked owing to their inaccessible position.

39. *Shisham and Khair.*—These species are as usual gregarious occupying the alluvial deposits of the islands and of the low flats along the banks of the main streams, whilst a little Khair is also found in places on hilly ground. The most extensive stretches covered with these trees are to be found in the upper reaches of the Nindhaur and of the Kalaunia, but there are very few large trees. The contents of the working circle are summarized as follows:—

Name of Forest or Block.	I. Class.		II. Class.		III. Class.	IV. Class.	Total.
	Sound.	Unsound.	Sound.	Unsound.			
		Shisham.					
Jariakhal	...	...	1	1	7	17	26
Barmdeo	2	...	34	...	782	3,097	3,915
Chini	1	...	3	...	9	31	44
Kalaunia and Dula Gad,	30	12	214	10	763	2,607	3,636
Nindhaur valley ...	40	...	388	...	10,911	4,212	15,551
Total ...	73	12	640	11	12,472	9,964	23,172
		Khair.					
Jariakhal	...	...	8	...	99	508	615
Barmdeo	17	...	100	...	952	2,742	3,811
Chini	2	...	8	...	64	121	195
Kalaunia and Dula Gad,	7	...	63	4	1,441	13,528	15,043
Nindhaur valley ...	18	...	94	...	1,123	10,911	12,146
Total ...	44	...	273	4	3,679	27,810	31,810

It will be observed that there are scarcely any trees of the first two classes, the proportion of old trees to young being for Shisham 1 to 30 and for Khair 1 to 98.

40. *Haldu (Adina cordifolia).*—Haldu does not occur throughout the forests, but is mainly confined to the Barmdeo reserve and to the foot of the hills elsewhere.

It has only been valued in the Barmdeo forest and the enumeration gives the following results :—

Name of Forest.	I. Class.		II. Class.		III. Class.	IV. Class.	Total.
	Sound.	Unsound.	Sound.	Unsound.			
Barmdeo	1,739	56	...	...	...	...	1,795

The total absence of II, III, and IV, class trees is very remarkable, and there can be no doubt but that this valuable species will soon disappear from the Barmdeo reserve; indeed, it seems to be losing ground everywhere in the Bhábar forests, although the reason for this does not yet seem to have been determined.

41. The number and variety of other species found in these forests is very great as will be seen from the list given at the beginning of this chapter, but unfortunately there does not exist any demand for their timber, so that their importance from a commercial point of view is at present insignificant. Many of them, however, are of great botanical interest as they are here near their western limit. Such for example are :—

Heynea trijuga.
Piptadenia oudhensis.
Heptapleurum venulosum.
Hyptianthera stricta.
Mœsa argentea.
Bassia butyracea.
Symplocos racemosa.
Schrebera swietenioides.
Thunbergia coccinea.
Ficus pubigera.

42. *Bamboos.*—The principal export of bamboos is through the Kilpura chauki, the bamboos coming chiefly from the Kalaunia, Dula Gad, and Chini forests, whilst a large quantity also passes through Chandani and Tanakpur. In 1884-85 the export through the chaukis connected with the working circle amounted to 79,142 scores.

43. *Other Minor Produce.*—The minor produce passing through the chaukis connected with the working circle consists chiefly of the following articles, the figures showing the amount exported in 1884-85 :—

Skins	No.	2,442
Horns	„	2,449
Baskets	„	54,814
Matting	Yds.	2,329
Kaphal bark	Mds.	95
Lodh „	„	77
Pipla mor	„	123
Honey	„	68
Wax	„	44

CHAPTER VI.

Past working, forest fires, and grazing.

44. *Past working.*—Some idea of the extent of the former felling operations in the Kumaun Division which then extended to the Ramganga, may be gathered from the fact that, between 1859-60 and 1879-80, the timber cut and sold by Government agency amounted to 3,040,241 cubic feet, and that between 1865-66 and 1879-80, the quantity cut and exported by private agency amounted to 2,620,607 cubic feet. The greater portion of the timber was Sál of good quality, though of late years second-class timber has come into considerable repute, and in addition to this, great quantities of dry timber were exported by merchants at lower rates.

45. With the exception, however, of the portions along and near the foot of the hills these forests were not worked until 1881-82, when timber works were started on a regular system in accordance with the plan of operations laid down in the Inspector-General's suggestions of 1881. The compartments to be felled during the following working season are carefully inspected by the Divisional Officer and all Sál

trees which may be felled are marked by him and his subordinates. A cart-road is then constructed, if not already in existence, to tap the compartment, and branch roads are made from it wherever necessary. Until 1883-84 the work was carried on as follows :—During the first season's operations logs were removed by departmental agency and carried to depôt. During the second season beams and scantlings were prepared departmentally and carried to depôt. During the third season merchants were invited to convert and export, in the shape of logs, beams, and fair-sized scantling, any timber which was not considered worth conversion and removal by departmental agency. And during the fourth season petty merchants converted and exported all rejected trees and refuse wood in the form of sides and ends of bedsteads and stools, &c. There is a fixed royalty on all the different kinds and sizes of wood exported (*vide* appendix D), which is taken from the exporters at the khám-tahsíl revenue-collecting stations. During these operations none but *marked* trees are allowed to be felled. As soon as all work in a compartment has ceased it is cleared of creepers and protected from fire if not already under fire-conservancy.

46. In 1883-84 the whole of the timber works in East Kumaun were conducted on the private agency system; and as regular timber works only commenced in these forests in 1881-82 a very fair comparison of the profits of the two systems can be deduced from the two years of Government agency, and this year of private enterprise.

Sál timber prepared by departmental agency and sold from depôt during the years 1881-82 and 1882-83 :—

			Cubic feet.
Brought to depôt			51,877
		Rs.	
Sold at depôt cubic feet 23,285 for		31,104	Rs.
Value of cubic feet 28,592 left in depôt (a great deal second and third class)		26,734	
			57,838
Cost of preparing and bringing the timber to depôt ...			29,833
Surplus ...			28,005

or an average profit of 8 annas and 8 pies per cubic foot.

			Cubic feet.
Sál timber cut and exported by private agency during the year 1883-84			35,457
			Rs.
Revenue received from the above			26,164
Departmental expenditure			586
Surplus ...			25,578

or an average profit of 11 annas and 6 pie per cubic foot. Thus we see that in East Kumaun there is a balance of 2 annas and 10 pies per cubic foot in favor of the private agency system.

In the following year however (1884-85) there was a decrease in the division due to a less demand for Sál in the forests east of Haldwáni.

The merchants are allowed to convert the timber into the form of produce they require. Trees suitable for logs, however, are only given to those who will take them out as such. A stamped contract is taken from each contracter in which he binds himself to comply with all the local rules.

47. Departmental operations were undertaken during the past season of 1885-86 in order to supply sleepers to the Rajputana-Malwa Railway; 20,000 sleepers were sawn up and all taken by the railway at a price of Rs. 2-8-0 each delivered at Achnera. They cost Re. 1-5-6 each to deliver, so that there is a profit of Re. 1-2-6 per sleeper or 12 annas per cubic foot. During the coming season 20,000 more sleepers have to be supplied to the same Railway, and will be obtained chiefly from the Aonla Khera North and South blocks in the Nindhaur valley.

48. With the exception of the two blocks on either side of the Balot river, Balot North and Balot South, not far from Chorgalia and which were worked in former

years, the forests of the Nindhaur valley were scarcely touched at all until 1881-82. In 1881 Mr. Brandis proposed during the next five years to remove 50,000 cubic feet of Sál from 1,250 trees annually, and take in hand six blocks in the following order:— Silani, Khonani North, Bhalsani, Khonani South, Aonla Khera North and Aonla Khera South, but on account of the natural difficulties in working the Bhalsani block, the question of postponing the felling in this block was left open for consideration.

49. The results of the operations undertaken in accordance with these proposals are given in the Forest Code Form 2 appended to this report, and may be briefly stated in the following tablular form:—

No. of Block.	Name of Block.	Area in acres.	Kind of tree.	No. of I class trees.	No. of trees felled.	Area worked over acres.	Yield in cubic feet.
XVII.	Silani	1,811	Sál ...	3,050	1,288	1,811	46,599
XIX.	Khonani North ...	1,511	„ ...	2,074	1,778	1,511	62,497
XXI.	Bhalsani	1,266	„ ...	1,597	127	609	4,067
XVIII.	Khonani South ...	1,532	„ ...	3,450	1,075	1,532	42,336
XXII.	Aonla Khera North ...	1,691	„ ...	2,505	*Nil.*	*Nil.*	*Nil.*
XXIII.	Do. South ...	1,485	„ ...	2,631	336	624	14,332
	Total ...	9,296	„ ...	15,307	4,604	6,087	169,831
XVII.	Silani	...	Sain ...	1,864	375	1,214	9,805
XIX.	Khonani North ...	...	„ ...	1,122	50	1,079	1,403
XVIII.	Do. South ...	...	„ ...	1,124	92	595	2,560
XXI—XXIII.	Aonla Khera North and South Bhalsani.	...	„ ...	4,010	*Nil.*	*Nil.*	*Nil.*
	Total ...	...	„ ...	8,120	517	2,888	13,768
XVII.	Silani	...	Chir ...	192	22	658	1,696
XIX.	Khonani North ...	...	„ ...	31	1	183	70
XVIII.	Khonani South ...						
XXI—XXIII	Aonla Khera North and South Bhalsani.	...	„ ...	819	*Nil.*	*Nil.*	*Nil.*
	Total ...	...	„ ...	1,042	23	841	1,766
	GRAND TOTAL ...		Sál, Sain and Chír.	24,469	5,144	6,087	185,365
Average annual outturn		...	Sál ...	...	921	1.217	38,966
Ditto	do.	...	Sain ...	...	103	574	2,754
Ditto	do.	...	Chír ...	...	4	168	353
Ditto	do..	...	Sál, Sain and Chír.	...	1,028	1,217	37,073

Comparing this outturn with the amount it was proposed to cut during the five years, we find that as regards sál a balance remains of 2,166 trees and 80,169 cubic feet; but if the limit proposed in this plan of 1.000 trees be adopted the balance would be 396 trees only. Nothing was laid down as to the number of Sain and Chír to be cut, but the quantity exported was far below the possibility of the forests. The first class Sal trees which remain in the compartments in which fellings have been completed are for the most part in inaccessible positions where they cannot be sawn up, or so far from the road that the cost of carriage is prohibitive. The reason why the full quantity of Sál was not exported in accordance with the proposals of 1881 was slackness in the demand as explained in the succeeding chapter.

Amongst the Sál trees felled were some second-class ones which perhaps partly accounts for the low average yield per tree, *viz.*, not quite 57 cubic feet. In the case of Sain the yield per tree was about 26 cubic feet and of Chír 77 cubic feet.

50. In addition to the Sain cut in the Nindhaur valley 10,871 cubic feet were cut from the hill forests east of Jaula Sál mostly from Kalaunia, Sain is nearly always exported in the shape of karis and Chír as logs. The sawing of dry Sál on hill sides in places inaccessible to carts is permitted in East Kumaun, and 24,870 cubic feet were exported in 1884-85, and over 35,000 cubic feet in 1885-86, but it is not known how much of this came from the working circle, although probably the greater part.

51. *Forest fires.*—Fire-protection was only started in these forests in 1882 and has not, as yet, been extended beyond the Nindhaur valley.

The protected area is surrounded by outer fire lines about 21 miles in length, but no interior lines are required, so that 481 acres are protected for every mile of fire-line :—

Number of Block	Name of Block.	Area attempted.	Failures	Area protected.	Total cost.	Year when protection was commenced.
		Acres.	Acres.	Acres.	Rupees.	
XVII	Silani	1,811	1,811	...	...	1882
XVIII.	Khonani South (part of) ...	490	...	490	91	
XVIII.	Do. (remainder) ...	1,042	...	1,042		1883
XIX.	Do. North	1,511	640	871		
XXI.	Bhalsani	1,266	...	1,266	602	
XXII.	Aonla Khera North	1,691	...	1,691		
XXIII.	Ditto South	1,485	1,000	485		
XX.	Rata Rau	811	...	811	1,063	1884
	Total ...	10,107	3,451	6,656	1,756	

There were really only two fires, one in May, 1883, which burnt 640 acres in Khonani North, and the other in April, 1884, which burnt the areas shown under failures in the above table against Silani and Aonla Khera South. Both these fires crossed the outer fire-line on very windy days. The forests in the valley remain green until the latter part of April, and consequently the dangerous period for fires is a short one, but at the same time the dampness greatly retards the satisfactory burning of the lines.

The beneficial effects of protection are already showing themselves in improved reproduction ;—*vide* para. 35.

Some parts of the valley of the Sarra nadi like that of the Nindhaur are very damp and appear often to escape the annual conflagrations, but, where not protected, the greater part of the working circle is burnt regularly, the fires destroying a vast number of young seedlings and causing more or less considerable damage to the trees themselves, especially in the Barmdeo reserve.

52. *Grazing.*—Owing to the proximity of very large areas of open forest and of forests outside the hills, very few cattle graze in the woking circle. In fact, cattle from only two gots do so, *viz.*, those of Dula Gad and Kalaunia. The number of cattle in these gots during 1885 86 was :—

Name of got.	Cows.	Buffaloes.	Sheep and Goats.	Ponies.	Total.	Amount. paid.
						Rs. a. y.
Kalaunia	188	39	...	3	230	67 4 0
Dula Gad	319	222	82	1	624	196 2 0
Total ...	507	261	82	4	854	263 6 0

CHAPTER VII.

Demands for produce and lines of export.

53. The following remarks are made in the Annual Report for 1884-85 with reference to the demands for produce in East Kumaun :—

"This is only the second year of the private enterprise system in these eastern forests, and we are not quite sure of the reason why there was less demand in 1884-85 than in 1883-84. The working season is shorter there than in the forests further westwards, and perhaps the falling off may have been due to a few cases of cholera in the early part of the season having frightened the merchants and workmen, and prevented their coming up to the forests as early as usual, or it may have been due to more Sál timber having been cut in the Nepal forests than during the previous year. We are opening out these eastern forests more and more every year by improving the old roads and making new ones, and in a few years I expect a very considerable increase in revenue from them, and a steadier demand for all kinds of forests produce."

54. With reference to the working circle Mr. Bryant says that beyond Sál there is a certain demand for Sain and Chír, but that nothing else is saleable at present. There is a large demand for Dhauri (*Anogeissus latifolia*) and Haldu outside the hills near the Tanakpur Haldwáni road, and if fellings here were stopped, or when the supply runs short, a demand for these woods would soon be created. The Pilibhít

Railway has but little effect on the demand, but the Rohilkhand and Kumaun Railway has stimulated the demand for Haldu, Dhauri, and Semal as well as for Chír. Most of the produce goes to Meerut and Delhi, and the state of the market there influences the demand directly, as does also the outturn of the Nepal forests and the amount and prices of timber for sale at the Bahramghát depot. Śál poles from thinnings could certainly be sold if not too far away. There is a constant demand for such poles by the Canal Department for the repairs of bunds, &c, at Kichar, and from Chorgalia merchants will take as many as they can get, whilst at lower rates they could be sold further east.

55. The Kumaun Division price list for round and sawn timber and for Bamboos is given in Appendix D.

56. *Lines of export.*—Except in the Nindhaur valley no roads have as yet been made opening out the forests. The construction of the Nindhaur valley road was begun in 1875 and completed in 1877 at a cost of Rs. 14,500. It is a capital cart-road from Chorgalia right up the valley to Durga Pipal, 17 miles in length and 18 feet in breadth. It was a difficult road to make, but has been steadily improved every year by building pucka walls and bridges and blasting rocks, and is much used for 12 miles above Chorgalia for carting out logs of dry timber and bamboos, and also for the export of green timber from the blocks which are being worked. Temporary paths are made wherever fellings are in progress, but these do not, as a rule, last more than a year or so, being only intended to serve for the immediate export of the timber. The annual cost of repairing the cart-road is usually about Rs. 36 per mile.

57. There is also a bridle-path 4 feet wide and over 16 miles long from Bhainsadunga to Airideo, following the ridge between the valleys of the Nindhaur and Sarra nadis and the plains. This path was made mainly in 1879 ; the lower portion is used as a fire-trace, and it will be still further utilised in this way when fire-conservancy is extended further up the valley, whilst it is very useful for inspection purposes. It cost about Rs. 2,000, and the annual expenditure on repairs is estimated at Rs. 12 per mile. It will probably be extended to Kalaunia, and is connected with the Nindhaur cart-road at Khonani by a path 3 miles long. In compartments Kalaunia East 8, Dula Gad 8, 9, 20, and 21, there are traces of old bridle-paths which Ranger Sis Ram says were probably made before the mutiny. They are usually very well laid out and might, with a small expenditure, be made good again.

58. These are all the roads or made paths which at present exist within the working circle, but others play an important part in the export of its produce. Running along the base of the hills is the sub-montane road known as the Kandi sarak which is continuous from the Jumna to the Sarda. The working circle is mainly concerned with the portion between Haldwáni and Tanakpur, a distance of 40 miles. Here the road is 20 feet wide, and the part between Haldwáni and Chorgalia, 13 miles long, was made and is kept in repair by the district authorities, whilst the remainder, 27 miles in length, is in charge of the Forest Department, the repairs costing, as a rule, about Rs. 25 per mile, but last year it was straightened and virtually a new road made at a cost of Rs. 2,033. This road is connected with the forests to the north of it by the following paths :—

		Length—	
		Miles.	Chains.
Hatgadh sot, not passable for carts		2	60
Karakot „ 6 feet wide, passable for carts for about one mile		7	27
Bhargot „ 8 feet wide		2	75
Birgot „		2	60
Jaulá Sál „ 8 feet wide		1	20
Laikumia „ „		3	65
Dandagot „ „		2	70

The cost of annual repairs to these paths is put down at Rs. 10 per mile. Beyond this there are many little foot-paths used by coolies bringing out Bamboos, &c., but these are mere tracks on which nothing is expended.

59. The Kandi sarak is in turn connected with chaukis or depôts for the export of produce, and this year two new roads were made each 20 feet wide:—

	Miles.	Chains.
(1) From Bhargot sot to Sudlimah	3	20
(2) From below Kalaunia to Kilpura	3	16

All chaukis are connected with each other by a fine cart-road running from the Chorgalia Sitarganj road to Chandani 20 feet wide, and 27 miles 63 chains in length, the annual repairs of which are about Rs. 18 per mile.

At Chorgalia there branch off three roads, so produce can go *viâ* Sitarganj to Pilibhít, or to the Railway stations at Haldwáni and Lalkua. These two stations are each 13 miles from Chorgalia. All produce however taken by rail from the working circle goes from the Lalkua station, being brought there by a new road from Chorgalia, made for the purpose last year, as railway freight on 15 miles is saved by taking the produce to this station instead of to Haldwáni.

60. Besides the Haldwáni-Chorgalia road previously mentioned as being under the care of the district authorities there are other district roads which are important in connection with these forests:—

(1) The Chorgalia-Sitarganj road.

(2) The Lohaghát-Pilibhít road which passes between the Barmdeo reserve and the Chini block.

(3) A branch leaving this reserve close to the Barmdeo reserve and going to Barmdeo.

(4). A road from Barmdeo to Chandani chauki, where it meets the Lohaghát-Pilibhít road.

There is no road from Jariakhal, and any timber extracted is thrown into the Sarda, but very little except dry Sál and Bamboos is exported.

61. Produce from the working circle passes through the following chaukis:—

Name of chauki.	Forests from which the produce chiefly comes.
1. Chorgalia	Nindhaur valley.
2. Rinsah	Kalaunia forests and Chini block.
3. Sudlimat	
4. Kilpura	
5. Chandani	Barmdeo and Jhariakhal.
6. Tanakpur	

The particulars of the export of forest produce through these chaukis is given in Appendix A, and it will be observed that the value of the produce passing through Chorgalia nearly equals that of the other chaukis combined.

CHAPTER VIII.

Formatian of Blocks and Compartments and mode of conducting the Valuation Survey.

62. The Working Circle forms part of the Chaubainsi and Talla Des ranges, and it has been divided into 28 blocks, as below:—

Name of range.	Number of block.	Name of block.	Number of compartments.	Area.	Name of forest.	Area.
				Acres.		Acres.
Talla Des ...	I.	Jariakhal South ...	5	1,100	Jariakhal ...	2,315
	II.	„ North ...	...	1,215		
	III.	Khamari ...	5	610	Barmdeo ..	3,357
	IV.	Khapkot ...	3	433		
	V.	Bansa ...	5	803		
	VI.	Naghan ...	5	686		
	VII.	Dangaona ...	5	825		
Chaubainsi ...	VIII.	Chini ...	52	7,640	Chini ...	7,640
	IX.	Kalaunia East ...	22	3,428	Kalaunia ...	18,884
	X.	„ West ...	15	2,220		
	XI.	Dula Gad ...	36	5,311		
	XII.	Sarra North ...	25	4,912		
	XIII.	„ South ...	12	3,013		
	XIV.	Sunkheri ...	10	1,028	Nindhaur ...	25,400
	XV.	Balot South ...	7	1,067		
	XVI.	„ North ...	18	1,918		
	XVII.	Silani ...	10	1,811		
	XVIII.	Khonani South ...	7	1,532		
	XIX.	„ North ...	9	1,511		
	XX.	Rata Rau ...	5	811		
	XXI.	Bhalsani ...	6	1,266		
	XXII.	Aonla Khera North ...	8	1,691		
	XXIII.	„ South ...	7	1,485		
	XXIV.	Gaunia Rau ...	13	1,994		
	XXV.	Chila ...	9	2,057		
	XXVI.	Kholgarh South ...	10	2,342		
	XXVII.	„ North ...	20	2,890		
	XXVIII.	Durga Pipal ...	11	1,997		
		Total ...	...	...	...	57,596

These blocks were made by my predecessors in the work with the exception of Sarra North, Sarra South, Kalaunia West and Dula Gad.

63. *Compartments.*—All the blocks have been divided into compartments except Jariakhal North, which, owing to the inferior nature of its stock, was not valued.

The number of compartments is 340, containing on an aver age 166 acres or rather over a quarter of a square mile, but varying from 50 to 447 acres, although seldom less than 100 or more than 300 acres. They were chosen so as to include as far as possible a single main aspect or the entire valley of a small stream, and the boundaries were well-defined, ridge, spurs, watercourses or roads. It would probably have been better if two or more compartments had been grouped together and larger ones formed, but this, entailing a great deal of extra work, want of time prevented being done.

64. *Valuation Survey.*—The detailed valuation survey of these forests was commenced in January, 1881, by Mr. Dansey, who shortly afterwards made over charge to Mr. Fernandez, and the work was continued by that officer assisted by Mr. Broun until March, 1884. No work was done during 1882-83 as the Forest survey was only just completing its field work in the country between the Nindhaur and the Sarda rivers. On my beginning work in East Kumaun in January, 1885, the field work which remained unfinished comprised about 20 square miles in the upper valley of the Kalaunia and in the basin of the Dula Gad, and the enumeration survey of this tract was completed by the end of February.

Of the total area of 57,596 acres a complete enumeration of the species mentioned below was made over 51,071 acres, whilst the remaining area was described

only, as it either consisted of precipitous unworkable ground or contained an inferior stock not considered worth valuing. The surveyed area was, for the purpose of enumeration, divided into plots, which as a rule, correspond with the present compartments. At first these plots, whose boundaries follow natural features, were indicated on the maps, but they were not demarcated on the ground except by a blaze made at the time of the enumeration on the outside of the outermost trees ; but as a more effectual system of marking them was found to be necessary, the outermost trees were subsequently marked with a ring of white paint. This was found to be very expensive, and as whitewash prepared with good lime and rice-water answered the purpose, its use was adopted. This temporary demarcation was found to increase the amount of field-work by nearly 20 per cent. Sal, Sain, Chir, Shisham, Khair, and in the Barmdeo reserve, Haldu as well, were counted separately, the trees being divided into the following diameter classes :—

I.	Diameter above	...	...	...	...	2′
II.	„ from	...	...	...	...	1½′ to 2′
III.	„ „	...	...	...	...	1′ to 1½′
IV.	„ „	...	...	...	...	½′ to 1′

Trees of the I and II classes only were further classified as "sound" and "unsound." The soundness or otherwise of a tree cannot always be determined, and many trees which are unsound at the base may remain sound throughout the greater part of the workable stem. Trees were classed as unsound if they were noticeably decayed or hollow in the stem, if they had half-dead crowns, or were stag headed, or if they gave back a hollow sound when struck with an axe by a man standing on the ground.

The method of enumeration formerly followed was by tickets of different colors and various shapes, which were attached to the trees after they had been marked with an axe. The shape of the ticket denoted the kind of tree, and its color denoted the girth or diameter class ; so that, by keeping a careful account of the number of tickets issued and of the number returned, the balance that had been expended of each kind was known, and these numbers were assumed to be the number of each kind of tree that had been marked and ticketed. The source of error in this system was that the tickets were either accidentally lost or intentionally made away with, so as to lead to the belief that a large amount of work had been accomplished. Another system was therefore adopted in the present survey. Each enumeration party consisted at first of five men, *viz.*, one recorder and four gaugemen, the number of gaugemen being subsequently increased to seven ; the recorder was provided with a pencil and with a blank book ruled in six vertical columns to provide for the four diameter classes (two of which were sub-divided into sound and unsound trees), and into five horizontal divisions for the five kinds of trees to be counted. The vertical columns were headed by the names of the colors on the beam of the gauge which correspond to the diameter classes. Each gaugeman was provided with an axe and a gauge. The gaugemen advanced in line and blazed each tree at a fixed height from the ground. After blazing a tree they measured its diameter *at the blaze* and called out its specific name, the color denoting its diameter class, and in the case of the two highest classes they also called out whether it was sound or unsound. The recorder then made the necessary entry in his book, recording each group of ten trees separately by means of two vertical rows of four dots each, crossed diagonally by lines from corner to corner.

For the purpose of checking the work, certain plots were selected for resurvey, and the officer in charge of the check survey was present during the last half-day's recording in each plot, and he added the record made by himself to that made before his arrival, so as to prevent the men from fudging as soon as the totals from the check survey became known. The result of the check survey went to prove that the work was very good, and as the point at which each tree was orginally measured was marked with a blaze, it would always, during the check survey, be remeasured at the place at which the first measurement was taken.

65. The field-work occupied altogether a little over six months, only counting the actual working days, and during this period 2,125,237 trees were counted. The number of survey parties employed varied from four to eight and the number of gauge-men attached to survey party also varied at different times, so that the actual daily outturn per gauge cannot be correctly given, but roughly speaking the average was eight acres surveyed and 330 trees counted.

66. The total cost of the survey at the completion of the field-work amounted to Rs. 12,945 or, on an average, Rs. 25-3-0 for every 100 acres actually surveyed and 9½ annas for every 100 trees counted.

67. Full particulars of the results of the enumeration for each compartment are given in appendix B, and the figures for each species are discussed in Chapter V. The number of trees actually counted in the whole working circle are as under :—

Name of species.	*I Class over 2′ in diameter.*		*II Class. 1½′—2′*		III. Class	IV. Class.	Total.
	Sound.	Unsound.	Sound.	Unsound			
Sál	45,963	18,509	112,152	23,817	403,432	1,119,772	1,723,645
Sain	28,765	4,037	40,164	4,824	85 602	115,607	278,999
Chír	8,625	84	14,434	1	21,979	20,693	65,816
Shisham	73	12	640	11	12,472	9,964	23,172
Khair	44	...	273	4	3,679	27,810	31,810
Haldu ... .. (in Barmdeo reserve only).	1,739	56	...	...	...	...	1,795
Total ...	85,209	22,698	167,663	28,657	527,164	1,293,846	2,125,237

CHAPTER IX.

Description of blocks.

68. The descriptions are short and summary, and for easy reference are given in a tabular form. The only points in these descriptions requiring explanation are the figures in the columns for quality, density, and reproduction. The quality has been represented by co-efficients varying from 1 for the worst quality to 10 for the best; the density of the stock and the state of the production has been represented in a similar manner. It has only been found possible to insert the altitudes in cases where the 4″ to the mile maps have been printed.

DESCRIPTION OF BLOCKS (JHARIAKHAL).

Name of block.	Area.	Configuration.	Slopes.	Altitude	Soil.	Stock.	Quantity.	Density.	Reproduction.	Treatment.
	Acres.					JHARIAKHAL.				
I.—Jariakhal South.	1,100	A plateau on the right bank of the Sarda included between the Ganji Gád and the Kuralka-Khola, and bounded on the north by hilly ground, a little of which is comprised in compartments 4 and 5. It is traversed by one main stream, the Sukar Khola, and is everywhere furrowed by a number of nalas, which are usually dry. Along the Sarda and the Ganji Gád it is bordered by short slopes usually precipitous, but with a gentler gradient in the north-east. In the Sarda, at the mouth of the Sukar Khola, there is an island 31 acres in extent. General aspects south east and south-west.	In the hilly ground 15° to 40°.	...	A sandy alluvion with layers of clay tilted up to an angle of 20° apparently excellent for sál. In the hilly ground sandstone.	On the plateau a good forest of sál of all ages, from 60 to 80 feet high and occasionally with a girth of 10 to 12 feet, largely mixed with other species, such as katbhiliawa, bhilawa, domsal, &c., and in compartments 3 and 4 chiefly a sál pole forest with a number of large trees and with a few chír along the precipitous edge. There are several open places and patches with mixed forest which predominates in the east part (Singar jala), where there is some sál only along the west edge. On the hilly ground there is either a mixed forest and on western aspects katbhilawa with some sál, sandan and sain, or a poor mixed sál forest changing into a better sál pole forest on the lower slopes. The island contains a few khair and shisham and much long grass. Several trees have been killed during floods.	Sal, 4—7, on hilly ground 2—3.	5—8 ...	4—8, often in patches and checked by fires.	Dry sál, &c., and minor produce to be extracted as usual.
II —Jariakhal North.	1,215	Consists of nearly all the hilly ground forming the north portion of the Jhariakhal reserve, being bounded on the south by the preceding block, on the west by the Ganji Gád, on the east by the Bhaumaria sot, and on the west by the main ridge. General aspects south-east and west	Usually steep, frequently scarped and precipitous.	...	Sandstone and quartzite.	Generally a very open forest of bakli, sandan, and some poor sain, with a good proportion of katbhilawa, whilst some chír, usually with twisted fibres, cover the crest and ridges. In the deep sots there is a dense forest of mixed species, saonjna, *Phœbe* (?), with numerous climbers, especially vines and *Cæsalpiniæ*. Sál is found in a few places facing west and near the top of the ridge in one place with a gentle slope and east aspect, but the trees are small and very crooked.	Sál 3 ...	In the sál forest facing east 6.	In the sál forest facing east 7. There are some chír seedlings near most of the old trees.	Ditto.
						BARMDEO.				
III.—Khamari.	610	Included between the Kukria Pani on the west, the Kama-	On the hilly ground 10° to 20°. But near	...	Alluvial, the upper layer being more	The best sál is to be found on the south-west corner in the lower por-	Sál 4—5 ...	Sál forest 5—7, mixed forest	Sal 4—7, but often in patches; mixed,	To be fire-protected after the Nindhaur and Dula Gád areas

		ari Gád on the east, the outer forest boundary on the south, and the boundary between the open and closed forests on the north, consisting of a long gently-sloping undulating plateau ending towards the south in a few short but usually steep slopes, and drained mainly by the Gotam Gád and its feeders, with some hilly ground above bordering on the open forest. General aspects south and south-east.	the upper boundary 30° to 35,° and over 45° in places with easterly aspect.		porous than the lower, where water oozes out and which contains a large proportion of clay and overlies a sandy bluish marl which easily disintegrates. The thickness of the alluvium varies from 10 to 100 feet. The steep slopes are formed of sandstone.	tions of compartments 1 and 2, where it forms a pole forest mixed with bakli, katbhilawa, huldu, some bad bija-sál and a number of inferior bamboos. The poles are of a good height but are not perfectly straight and are frequently unsound. Sál also covers a large portion of the hilly ground in compartment 1, whilst elsewhere a few sal poles only are found in places, the forest being usually very open and mixed. There are some fairly dense patches of sufed siris (A. procera) in compartment 4 near the bottom of some slopes, and in compartment 5 the predominating species is a grewia. Bamboos of inferior quality are found nearly everywhere and there is a great deal of grass and brushwood in places.		3—5, on east aspects often only 2—3.	forest 2—4.	have been taken in hand; all haldu trees to be extracted.
IV.—Khapkot.	433	Consists of a long narrow elevated plateau with precipitous sides, of a strip of lowlying flat ground parallel to it on the east and of some hilly ground in the north, the whole lying between the Punioki gár and the Kukria-Pani, bounded on the south by the outer forest boundary and on the north by the boundary between the open and closed parts, together with a number of islands in the bed of the Punioki gár. There are traces of former cultivation at the foot of the hills.	In the hilly portions 30° or more.	...	An alluvial deposit usually overlying marl beds, loamy on the islands and sandy on the plateau, with sandstone boulders; whilst on the flat strip it is mixed with marl containing much lime, which is dissolved by the water in the rains and deposited in thick layers on the beds of the watercourses.	On the hilly ground and on the plateau chiefly a sál pole forest with a few bakli, sain, dhauri and bija sál together with some bamboos; on the flat strip a mixed forest of khair, shisham, siris, &c., and on the islands a mixed forest of shisham, khair, sain, siris, ambara, &c., but in some places only shisham and papri.	Sál 5, shisham and khair 5—6.	Sál forest 7, mixed forest 6.	Sál 5—6; on the islands either *nil* or otherwise plenty of young shisham or khair or both.	To be fire-protected after the Nindhaur and Dula Gad areas have been taken in hand; all haldu trees to be extracted.
V.—Bansa,	803	The entire block is included between the Dhara Pani and the Punioki gár, being bounded on the south by the outer forest boundary and on the north by the boundary between the open and closed forests. It consists of an undulating plateau bordered by short precipitous slopes on the east and west and by longer and more moderate ones on the south, of a low stretch of ground in	In the hilly ground 25° to 40°, in the slopes to the south bordering the plateau 10° to 30°.	...	The underlying rock is a rough, gritty sandstone, evidently of the Siwalik formation and the soil is mainly derived from the disintegration of this rock, of which fragments are found everywhere. It is fairly deep and permeable. In Bansa	The plateau is mainly covered with a young sal pole forest; the poles, although of a naturally vigorous growth and about 40 feet high, have been injured at the base by frequent forest fires; there are only a few large trees and these are generally unsound, but that sal is here capable of attaining large dimensions is proved by the fact that some trees over 12 feet in girth were measured in compartment 3. Mixed with the sál are a few other species such as sain, bakli, dhaura, bija sál,	Sál trees usually 2 but sometimes 5; sál poles usually 5—6.	Sal pole forest 5—9, as a rule 7.	1—7; usually much retarded by fires; most backward in the mixed forest.	To be fire-protected after the Nindhaur and Dula Gad areas have been taken in hand; all haldu trees to be extracted.

Name of block.	Area.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Quality.	Density.	Reproduction.	Treatment.
	Acres.					BARMDEO—(*concluded*).				
		the north-east along the Puniokigar, furrowed by several nalas and probably flooded during the rains, and finally of some rugged and stony hilly ground in the north-west, chiefly in compartment 4. General aspects south-east and south.			3 there is a stratum of iron ore (red hematite) cropping out near the foot of the hills.	&c., and occasionally numerous stunted katbhilawa; there are some large blanks containing a few trees such as figs, rauni, bakli, dhaura, dhak, chilla, paiman, &c., and in the lower half of compartment 1 the forest is more open, containing a number of katbhilawa and bakli and some sain. A similar young sál forest is also found in the south of compartment 5 (with some tolerably good sain) and on the hilly ground, except on west slopes, where there is chiefly bakli, dhaura, sain, siris, katbhilawa, &c. There is also a mixed forest in the upper two-thirds of compartment 5. Bamboos are common except on very low ground, but are only fairly good in the hilly ground.				
VI.—Naghan.	686	Included between the Sua Siloni and the Dhara Pani, bounded on the south and north by the boundary between the open and closed forests. It consists of a low-lying plateau, sloping gently towards the south, furrowed by several nalas and rather higher and more inclined on the east side, where it is bordered by short precipitous slopes, and also of some rugged hilly ground in the north. General aspect south.	In the hilly ground 20° to 30° more or less.	...	As in Bansa, but probably moister and not so well drained, and in compartment 4 higher above the stratum of marl.	On the plateau there is usually a sal pole forest somewhat injured by fire with a sprinkling of larger trees and of sain and also often other species such as bakli, dhaura, bhilawa, katbhilawa, &c. Mixed forest is found in compartment 1 and in the west part of compartment 5 as well as in patches here and there in the sál forest, containing such species as sain, khair, haldu, gosham, soanjna, bahera, dom-sal, jhingan, grewia, &c. Bamboos are common, but their quality is inferior.	Sál trees 2—5, Sal poles 5—7, Sain often 7.	Sal pole forest 6—9, mixed forest 5—7,	Of sál 2—6, Sain 0—3, often checked by fires.	To be fire-protected after the Nindhaur and Dula Gád areas have been taken in hand; all huldu trees to be extracted.
VII.—Dangaona.	825	Included between the Bali Gád and the Sua Siloni; bounded on the north and south by the boundary between the open	On the hilly ground 10° to 20°	...	Apparently nearly all of the lower (clayey) alluvium with sandstone on	With the exception of a small area in the south of comportment 2, which contains a sál pole forest, there are very few sál in the block,	Sál 2 or 3 to 5, sain 2 to 3.	5—6	Sál 2—3; bamboos abundant in patches.	To be fire-protected after the Nindhaur and Dula Gád areas have been taken in

		and closed forests. It consists of a plateau gently inclining to the south, undulating in the east and furrowed by several nalas, and of some hilly ground to the north. General aspect south.			the hilly ground.	and the same may be said of sain, the forest being essentially one of huldu and bamboo mixed with numerous other species, such as simal, kaim, lasora, amaltas, doldhak and a few khair in places. Bamboos abound and are superior to those found in other parts of the Barmdeo Reserve.				hand. All huldu trees to be extracted.
						CHINI.				
VIII.—Chini.	7,640	Consists of the hilly upper basin of the Chini Gád; in fact all that is included in the reserved forest and of that portion of the right bank of the Hathi Khor rau included within the same forest. The higher portions of the block, such as compartments 1 to 11, 20, 22, 38, 39, and 40, are very steep and precipitous, scarps, precipices and landslips being common everywhere; compartments 1 to 4 are especially rugged and craggy, with a succession of numerous rocky ledges; lower down the ground is less broken and precipitous, except in compartments 51 and 52, whilst there is some flat land here and there along the banks of the main streams; compartment 15 is 444 acres in extent, consisting entirely of a long narrow plateau. The prevailing aspects are south and south-east.	30° to 45° and over in the upper portions, 10° to 35° lower down, but usually between 20° and 30°.	...	The hills are mainly formed of alternate layers of sandstone, quartzite and marl, the soil being dry; superficial and stony on the precipitous slopes, somewhat better on the more moderate ones. In compartment 29 the marl outcrops below, and in compartments 33 and 34 ferruginous sandstone appears; there is good alluvium in compartment 15.	Owing to the precipitous nature of the ground and the inferior character of the stock, which is usually an open mixed forest of bakli, sandan, sain, &c., with some crooked sal on cooler slopes and a few chír on the higher ridges, compartments 1—4, 11, 20, 38, 39 and 40 have not been valued. In the rest of the higher portion there is usually on the more exposed slopes an open mixed forest of bakli, sain and sandan, with numerous kokat, and on others a mixed forest of inferior sál, sain, sandan, bakli, katbhilawa, bhilawa and other species characteristic of dry hillsides. The more moderate slopes are frequently covered with a sál pole forest, often of vigorous growth but somewhat injured by fires, with sain in patches and often numerous katbhilawa, bhilawa and sometimes bakli, *e. g.*, compartments 8—10, 16, 17, 18, 29—34, 36, 37, 42, 47—49, 51 and 52 and the plateau forming compartment 15 is similarly stocked. Large trees are usually rare, but that sal can attain a large size in places is shown by the measurement of a tree over 12 feet in girth in compartment 9. Some of the flat ground formed of clayey alluvium is covered with kokat or with grass and scattered trees only as on the Bargar chaor in compartment 48. Bamboos are common nearly everywhere, but are scattered towards the higher ridges, and in exposed compartments are only found at the bottom of valleys and in de-	Sál trees 2—6 usually 3, sál poles 2—6 usually 4—6, sain 2—6; as a rule 4.	Sál pole forest 6—8, mixed sál forest 4—6, open forest 2—5.	Very variable, usually about 4, but 6 and over in compartments 14, to 17, 30, 32, 37, 42 and 45: seedlings of the large bamboos are plentiful near the Gonya rau.	Dry trees, bamboos and other minor produce to be worked out as usual.

Description of Blocks (Kalaunia.)

Name of block.	Area.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Quality.	Density.	Reproduction.	Treatment.
						CHINI—(*concluded*).				
						pressions; some dead clumps of bambusa arundinacea occur along the lower course of the Gonya gár. Bhabar grass and spear grass are abundant in the warmer and more open parts of the forest.				
						KALAUNIA.				
IX—Kalaunia, east.	3,428	Includes the whole of the left bank of the Kalunia nadi within the reserved forest as far as its great bend to the west where the open forest comes down to the stream. It consists almost entirely of hilly ground with moderate or steep slopes as a rule, but sometimes very moderate as in compartment 6, and in other cases very precipitous as in compartments 16—18; on the right bank of the Chai khola and in compartment 9 directly above the Kalaunia. Compartments 2 and 3 are formed of chaors, and there are a few islands in the nadi. General aspects south-west below, west higher up, north on the left bank of the Chai khola and the Saj ki gár, south on the right bank of the former.	Usually 20° to 35°, but 15° to 20° only in compartment 6, and generally over 45° in compartment 17.	...	Marl and sandstones the soil being superficial as a rule. On the basin of the Chai khola on the less precipitous parts often loamy, the bare sandstone almost constantly exposed on the left bank. On the choar a deep alluvium well suited to sál where the drainage is good.	There is frequently a sál pole forest on the more moderate slopes as in compartments 1, 4, 5, 6, 12 13 and 19, and also on the undulating portion of the chaors. In the hilly part there is some sál with sain, sandan, katbhilawa, bhilawa and some bakli, &c., whilst at high elevations, as in compartments 12 and 13, there are some chír attaining fine dimensions in the last named compartment. In other places on favorable slopes there is a mixed forest of sál, sain, sandan and kokat, such as bhilawa as in compartments 20 to 22, whilst in compartments 14 to 16 there is a poor stock of small sál and sain, often crooked, with some sain, bhilawa, dhaula, &c., chír being intermixed and predominating in places, whilst mowa (Phyllanthus nepalensis) is conspicuous amongst the kokat. On the precipitous ground in compartments 9, 17 and 18, the two first of which have not been valued, the ground is either bare or covered with a few Acacia eburnea, some small bakli, sandan and sain, and just above the Kalaunia on the lower slope of compartments 5, 6, 7 and 8 there is an open mixed	Sál trees 1—7 usually 4, sál poles 2—7 ruling 5; sain 2—5, chír 4—7.	Sál pole forest 6—7, mixed sál forest 3—7, average 5; open mixed forest 3—5.	1—5, but as a rule 2—4, best in the north.	Dry trees, bamboos and other minor produce to be taken out as usual.

						forest. The islands in the nadi contain some shisham and khair, whilst on the lowlying part of the chaors there is nothing but high grass or a mixed forest of huldu, bakli, dhaura, &c. Bamboos are generally plentiful and of good quality.				
X—Kalaunia W.	2,220	Includes the right bank of the Kalaunia from Kalaunia got to the boundary of the open forest of Katol. The ground is very precipitous and broken in the north as over most compartments 1—7, and is generally steep in the remaining compartments. There is some flat ground in compartment 13, and many gentle slopes in compartment 10. General aspects east, south-east and north.	In precipitous parts usually over 40°, elsewhere ruling 35°.	...	In the upper precipitous parts the soil is sandy or often absent, the sandstone rock being exposed, whilst lover dewn there is marl and sandstone.	On the more precipitous parts there is usually a very open forest of sain, bakli and sandan with some sál and kokat, and chír on the higher ridges, or an indifferent mixed forest of sál and sain, with some katbhilawá, sandan, bakil, &c. The latter type of forest, but of better quality, is also found on many of the more moderate slopes. Bamboos are both numerous and good.	Sál 3-7 average 4, sain usually 3—5, rarely 7.	In the open mixed forests 1—5. usually 3—4; in the mixed sál forest 4—7, average 6.	Very scanty as a rule.	Dry trees bamboos and other minor produce to be taken out as usual.
XI—Dula Gad.	5,311	Comprises the hilly part of the basin of the Dula Gád as far south as the Morcha khola. The ground is very precipitous and broken at the source of the Dula Gád in compartments 19—21, but improves below where moderate slopes are the rule, the best of all being found on either bank of the Banjaria sot. There is some flat ground in the south over most of compartments 1, 6, 7 and 15, the latter containing several islands in the Dula Gad. The predominating aspects are south-east and south-west.	In the precipitous parts usually over 40°, on the more moderate slopes 15°—30°.	...	In the upper parts as in the preceding blocks. In the basin of the Banjaria sot there is either loam, stiff loam or clay intermixed with sandstone fragments with frequent outcrops of that rock. On the flat parts there is usually a loose alluvium.	In the upper parts as in the preceding block, elsewhere as in compartments 1, 2, 4—7, 10—12, 16, 23—26 and 31—36, there is chiefly a sál pole forest, almost pure, as in parts of compartments 32—36, or mixed with a variable quantity of katbhilawa, bakii, sandan dhaura, kokat and a few sain, poles of the first named species almost predominating in compartments 25 and 26. The stock is very full in the lower part of the Banjaria sot, where the sál poles are often from 42—100 feet high hand fairly well grown. On the flat ground at the junction of the Banjaria sot with the Dula Gád there is a mixed forest of shisham, khair, huldu, chilla, aonla, &c, and on the islands either young shisham or khair, or a mixed forest with some fine huldu, which is also rather common elsewhere along the foot of the hills. Bamboos are less abundant than in the preceding block, and in the Dula Gád they are found chiefly in depressions, whilst they are very few and poor in the dense young pole forest along the Banjara sot.	As above, sál poles 4—7, average 5.	As above and in the sál pole forest 6—10, average 7.	1—5, on the average 4.	To be fire-protected, two fire-paths being made from Airideo one down the Bhalla Garhidhar and the other down the ridge forming the boundary between the Dula Gád and the Kalaunia west blocks. Thinnings to be made in the following compartments during the next ten years in the order given: 36, 352. 34, 33, 32, 31, 28, 27, 26. 25, 24 and 16, aggregating 1,535 acres.

Name of block.	Area.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Quality.	Density.	Reprodution.	Treatement.
	Acres.					KALAUNIA—(*concluded*).				
XII—Sarra North.	4,912	Includes the whole of the left bank of the Upper Kalaunia, here called the Sarra nadi, as far as its great bend to the south-west of the Raula Khola; the slopes are moderate and fairly uniform except near sots, often ending in small chaors close to the Sarra; east of the Raula Khola precipitous ground is commoner, especially toward the upper boundary, which here in places has an altitude of over 3,700 feet, but moderate slopes may still be said, on the whole, to predominate, whilst chaors are often met with. The most general aspect is south.	Variable ...	1,750′—3,715′	In the west a conglomerate consisting of clayey sand mixed with innumerable pebbles, and good loam in parts; further east the soil is loamy and covered with hard sandstone fragments along the upper boundary, the alluvium being confined to the immediate neighbourhood of the Sarra nadi.	The usual stock is a mixed sál forest containing besides sal, sain, bakli. sandan, katbhilawa, bhilawa and other kokat with some chír on the higher ridges in the west. The sál and sain are often crooked and stunted, especially in the extereme west, improving towards the east, whilst there are fine bits of forest on some of the chaors as in compartment 8 (on the Mudam chaor there is only kokat); there are also some good areas covered with sál poles, as in compartment 4 towards the top of the basin, where the poles are straight and frequently over 100 feet high. Bakli is particularly abundant on the left bank of the Raula Khola, and on the precipitous ground to the east, containing 773 acres which have been excluded from the valuation; there is usually a very open forest of bakli, sain, sandan and kokat with very few sál. There are no bamboos in the extreme west, but they gradually mix in towards the east, and east of the watershed line of the Raula Khola they are usually both abundant and good.	Sál 2—7 and up to 8 on the chaors.	3—9 usually about 7 in the mixed sal forest.	1—8 generally, good for sal and sain west of the Raula Khola and indifferent east of it.	Bamboos and other minor produce to be taken out as usual.
XIII—Sarra South.	3,013	Includes the whole of the right bank of the Sarra nadi as far as the ridge bounding the open forest of Kutol. The ground is often rugged and precipitous, especially the upper part, whilst there are gentler slopes near the nadi, bordering on which are several flats, and in which are a few	...	...	As a rule, a moist loamy conglomerate with numerous pebbles of quartz, &c., and an underlying bed of clay cropping out near the nadi; along the upper boundary the soil	Sál predominates mixed with sain and with chír on the ridges towards the upper boundary and in the more precipitous places; intermixed in small numbers are a few other species, such as sandan, harra, bhilawa, katbhilawa, padal, lodh, &c., with evergreens at the bottom of the deeper valleys; khair and shisham occur here and there	Sál 2—7 (fine trees on the Chachara khat), average 4, sain 4, chír 4—10; very fine trees in the lower west corner of compartment.	Chír portions 4, sál forest usually 4—7.	4—5 ...	Ditto.

		small islands. General aspect north.			is superficial and sandy with the sandstone rock frequently exposed.	bordering the Sarra and covering some of its small islands. Bamboos, as a rule, are not numerous, but their quality is excellent. The Maljan creeper is common in places.				
						NINDHAUR.				
XIV.--Sunkheri.	1,028	Includes the slopes on the right bank of the Nindhaur from Lodhealdhan to the water-shed line of the Balot Gadhera. The slopes are generally very steep, especially near the upper ridge; there are gentle slopes in the lower part of compartment 1. General aspects south-east and east.	25° to 60°, usually over 30°	1,200′-2,800′	Sandstone, soil as a rule superficial.	Up the Sunbhume Raula there is principally sál and sain with a sprinkling of other species, especially in the lower parts, whilst on the banks of the Sunkheri nala and the slopes to the north there is a fairly good young forest of the same species, but further north compartments 8, 9 and 10 are usually very badly stocked with some sál and sain, although there are a few fine trees near the river. Has not been valued.	...	Usually 7, but only 2 in the bad portion to the north.	Sál 4—6 ...	Dry wood, bamboos and other minor produce to be removed as usual.
XV.—Balot South.	1,067	Consists of the right bank of the Balot Gadhera, having usually gentle or moderate slopes, but occasionally precipitous as in the lower part of compartment 3 General aspects north and north-east.	5° to 45°, usually 15° to 25°.	1,400′-3,500′	Ditto ...	In the lower part (compartments 1 and 2) there is chiefly advanced growth of sal at the top, lower down very young sál poles, whilst at the bottom sál becomes less frequent. A little chír occurs on some of the ridges. In compartment 3 there is usually a good sál pole forest and in the upper portion of the block there is a flourishing young crop of sál well mixed with sain, the trees being nearly all of the fourth class, but on the south slopes of compartment 7 the forest is more open, containing chiefly inferior species.	...	Mixed sál forest 5—6, sál pole forest 7—8.	As a rule good	Ditto.
XVI.--Balot North.	1,918	Comprises the left bank of the Balot Gadhera, the right bank of the Dwarmial Gad and of certain slopes between them which drain directly into the Nindhaur. The ground is commonly very steep or precipitous, but there are some more moderate slopes in the upper part of the Balot Gadhera and also on the banks of the Dwarmial Gád, although here precipitous ground is by no means absent. General aspects south, south-east and north.	Usually over 30° and often much more, but as little as 15° in parts of compartments 1 and 4.	1,360′-4,760′	On the bank of the Balot Gadhera rocky, in the upper parts sandstone, soil usually superficial but fairly good for sál. On the bank of the Dwarmial Gád, in the west part sandy, generally moist and shallow, but overlying soft sandstone and good for sál. In the east often unproductive or a consolidated boulder formation.	On the banks of the Balot Gadhera there is usually a mixed sál-forest, the proportion of sál to other species varying from 1 : 9 to 1 : 6; the rocky parts of compartments 4 and 5 are nearly bare. On the slopes over the Nindhaur there is a young mixed sál forest, the proportion of sál being as 1 · 10 and 1 : 5 in compartment 17. On the banks of the Dwarmial Gád there is an excellent young sal forest, save in the more precipitous compartments, 15 and 18, where the stock is inferior and about one-fifth of the area is blank.	On the banks of the Balot Gadhera 1 on rocky parts, 3—5 elsewhere over the Nindhaur; 2—3 along the Dwarmial; 6 in best parts.	0 to 7, average 5.	Usually good ...	Ditto.

Description of Blocks (Nindhaur).

Name of block.	Area.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Quality.	Density.	Reproduction.	Treatment.
	Acres.					NINDHAUR—(*continued*).				
					resting on sandstone. Along the Nindhaur alluvium overlying sandstone, which is exposed near the main ridge and on scarps.					
XVII.—Silani.	1,811	Consists of slopes on the south bank of the Nindhaur between the Jhapwa para dhar and the west watershed line of the Dhobipata Gadhera. The ground is usually steep and scarps are common; it is particularly rugged and steep in compartments 2 and 10; whilst the slopes are more moderate and fairly uniform in compartment 1 and at the head of the bay in compartments 8 and 9. General aspects north, north-west and north-east.	35° or over, but only 30° in parts of compartments 1, 8 and 9.	1,360′–3,245′	A sandy loam, not deep as a rule, but excellent for sal.	A mixed sál forest, the proportion of sál to other species being as 1 : 10 or often slightly more.	4—5 ...	4—6 ...	Of sál very fair as a rule.	Fire protection to be continued. More 1st class sain to be exported if possible.
XVIII—Khonani South.	1,532	Consists of slopes on the south bank of the Nindhaur included between the preceding block and the east watershed lines of the Jilna Khol sot. Ground similar in character to that in the preceding block; some flat ground near the river in compartment 6. General aspects north and north-west.	Steep in the west 35° or over with scarps in the east.	...	Do. frequently with underlying soft sandstone, good for sal.	A superior type of the class of forest found in the Silani block, the best stock being on the broad open slopes at the head of some of the basins. The flat ground is principally open grass land.	...	...	...	Fire-protection to be continued. As many 1st class sain to be removed as possible.
XIX—Khonani North.	1,511	Contains the slopes on the north bank of the Nindhaur from the Gunia dhar to the west watershed line of the Bhalsani nadi. Ground more rugged and precipitous than in the preceding block, especially in the	Very steep, scarped or precipitous in the upper, portions more moderate in compartments 1 and 2 and often	1,450′–4,514′	Sandstone, soil superficial on the steep slopes, deeper on the more moderate ones.	In the upper portions the precipitous ground is often almost bare or with patches of *Acacia eburnea* or covered with a very open forest of bakli and bamboos with a little sál or sain, but where the ground is less broken there is not unfrequently rather a well mixed forest of sál, sain	...	0—7; on the more moderate slopes usually 5—7.	In sál forest 5—8.	Fire-protection to be continued. As many 1st class sain to be removed as possible.

		upper part of the numerous basins. Some flat ground near the river as Khonani and Limbu Jala. General aspects south, south-west and south-east.	gentle near the river.			bamboos, &c., or even a nearly pure young sál pole forest as in compartment 5. Lower down on the gentler slopes there is usually a good mixture of sál, sain and bamboos with some fine trees, and in compartment 9 either sál as a high pole forest as advanced growth or blanks. The flat of Khonani is well stocked with fine trees of sál and sain above the road, whilst below, although good in places, there are some large grassy blanks. Some shisham are found along the Nindhaur.				
XX.—Rata-rau.	811	Contains that part of the left bank of the Rata rau which is included within the reserved forest. Ground generally precipitous with scarps near the rau and with better and more uniform slopes higher up. General aspects north and north-west.	Very variable, 5° to 40° and over, usually 20°—25° in compartment 3.	1,450′–3,847′	Sandstone, soil superficial on steep slopes, deeper on the more moderate ones.	Sál and sain generally occur in the shape of poles, there being only a few big trees; they are in some places nearly pure, in others mixed with bakli and bamboos or in the higher parts with chír. Compartments 4 and 5 are rather poorly stocked with chír and sál, but here and there are some thriving sál poles.	...	4—7	...	5—7	...	Fire-protection to be continued.
XXI.—Bhalsani.	1,266	Comprises the basin of the Bhalsani nadi and the right bank of the Asni Gád as far as it is included within the reserved forest. The ground is generally precipitous along the streams, elsewhere every gradient is well represented, whilst in the south are the Rupjala and Dhautjala chaors. The main stream in its upper part passes through a narrow gorge with precipitous sides and waterfalls. General aspects east, south-west, and south.	5°—50° and over, as a rule 20°—35°.	1,650′–4,514′	A soft friable sandstone, soil superficial on steep slopes, deeper on more moderate ones, some alluvium (not deep) on the chaors.	Usually a mixed sál forest with sain and bamboos, there being some fine trees on the Dhautjala chaor and on the north slopes in compartment 2, where there is a good high pole forest. The most precipitous portions are often bare or covered with bamboos only, and in the upper part of Bhalsani 3 there is a poor forest of chír, bakli and sain, whilst on the old village site, Jasal garhi, there are only a few large semal and mango with scrub such as wild lime.	...	0—7	...	Variable, often good in open places.		Fire-protection to be continued and the block to be worked if the cost of opening it out by a road be not too great.
XXII.—Aonla Khera North.	1,691	Consists of the entire area of the reserved forest included between the Asni Gád. The ground is usually very steep and precipitous near streams, compartment 5 being extremely precipitous; but in compartment 8 on the Adwar Gád the slopes are moderate. General aspects south-east, south-west, east and west, and in compartment 8 north and north-east.	15°—50° and over, in compartment 8 15°—20°.	1,750′–3,811′	Sandstone, soil superficial, covered with loose rolling stones and in places with boulders.	Generally a well-mixed forest of sál and sain with a large quantity of bamboos and often mixed with kát-bhilawa; in compartment 8 the sál and sain are chiefly of the third and fourth classes, which is also the case in compartment 6, and in the north of compartments 5 and 7. There are some chír on some of the higher slopes, and there is a quantity of bakli in the highest part of compartment 7.	...	5—9, as a rule 7—8.		Good in open places, but slight in compartment 8.		Fire-protection to be continued and as many 1st class trees as possible to be worked out, except under certain circumstances mentioned in the plan.

Name of block.	Area.	Configuration.	Slope.	Altitude.	Soil.	Stock.	Quantity.	Density.	Reproduction.	Treatment.
	Acres.					NINDHAUR—(*concluded*).				
XXIII.—Aonla Khera South.	1,485	Consists of all the slopes on the south bank of the Nindhaur from the South Khonani block to the Chila block. The block is, as a rule, extremely rugged.	15°—70°, ruling 25°—30°.	1,650′–3,714′	Soil commonly shallow and dry, exposing the sandstone rock in many places; but in some places moister, consisting of a fairly deep sandy loam mixed with rock *debris*.	Compared with preceding blocks the present area is remarkable for the almost total absence of sál saplings and young poles, but the proportion of sal to other species is usually high, varying from 1 : 2 and 1 : 4. There is a sprinkling of chír on the higher ridges and the stock in compartment 4 is very poor, consisting in the lower half of a scrubby open jungle with numerous *Acacia eburnea*, somewhat improving above.	1—3	...	0—7·5, ruling 4—5.	Very variable and generally good only in patches.	Fire-protection to be continued, and as many first class trees as possible to be worked out, except under certain circumstances mentioned in the plan.
XXIV.—Gaunia rau.	1,994	Contains all the forest closed to rights on the north bank of the Nindhaur between the Aonla Khera Gád and the Gaunia rau and some south slopes in compartment 13 north of the latter stream. Compartments 6—9 are formed of an isolated hill with rather steep slopes. The ground in the upper part of the Adwar Gad and of the Gaunia rau in compartments 1, 2 and 13, and also in compartment 5, is very steep or precipitous, whilst more moderate and even slopes prevail elsewhere, especially in the lower parts, where there are occasional chaors as the Duda and Kholgarh.	Very variable; the most common being from 20°—30°.	1,800′–4,200′	Friable sandstone, the soil being ordinarily superficial. The isolated hill also consists of an easily crumbling standstone forming in a great many places a deep and even very deep soil, excellent for sál. Alluvium occurs mixed with numerous pebbles on the lower gentle slopes of compartments 10 and 11.	On the banks of the Aonla Khera Gád and of the Gaunia rau there is frequently a sál and sain pole forest of variable age, as also on the flat below the road in compartment 4, but there are very few sain in compartment 12; there are also generally mixed in a few katbhilawa, sandan and a little chír on the higher ridges; there are some fine trees in places. The isolated hill contains a mixed forest of which about one half is sal, as well as sain and an abundant sprinkling of chír, elsewhere there is the usual mixed forest of sál and sain associated with katbhilawa, sandan and bamboos. The Kholgarh chaor is covered with grass about 12 feet high.	...	Sál pole forest 6—8 on isolated hilll, 7·5 elsewhere, as a rule 6—9.	Usually scarce, but good on the bank of the Gaunia rau.	Ditto.
XXV.—Chila.	2,057	Contains all the slopes on the south bank of the Nindhauar between South Aonla Khera block and South Kholgarh.	...	1,800′–3,666′	Sandstone soil of the usual shallow character and sometimes absent, the rock being exposed. In compartments 4 and 5 a sandy loam excellent for sal.	Generally a mixed sál forest with a varying proportion of chír and other species, the chír being most abundant on the ridges.	2—3	...	Very variable; 5—7·5 in compartments 1, 3, 4 and 5, usually much less in compartments 6—9.	Usually very backward: sál seedlings abundant in patches in Chila 1 and 3.	Ditto.

XXVI.—Kholgarh South.	2,342	Contains all the slopes on the north bank of the Nindhaur between the Chila and Durga Pipal blocks. The ground is often much broken, with steep slopes and frequent scarps, more moderate in compartments 3, 7 and 9 and fairly uniform in compartment 10. There is a rather broad stretch of flat ground (called Kholgarh) along the river in compartments 3 and 9. General aspects north, north-west, east and west.	In compartments 4, 5, 6 and 8, as a rule 40°. In compartment 1 about 35° and 9 about 25°.	1,900′–3,871′	In compartments 4, 5, 6 and 8 large areas are unproductive, the soil being superficial or frequently absent. In 1, 2 and 7 not deep but seldom absent. In 3 and 9 on the flat, a sandy loam often deep and always rich and moist.	Principally a very poor mixed sál forest with some sain and a sprinkling of chír mainly along the crests of spurs and ridges. The proportion of sál varies from 1 : 5 to 1 : 10. There is a very poor open crop in compartment 8. The flat ground is principally a grassy expanse in compartment 3, whilst in compartment 9 there is a shisham and khair forest of some promise.	1—2	...	0—7·5, on the average 3—4.	Usually very backward; fair and often excellent in compartment 7.	Ditto.
XXVII.—Kholgarh North.	2,890	Contains all the slopes on the north bank of the Nindhaur east of the Gaunia rau block, which are within the boundary of the reserved forest. Most of the best ground is found to the west of the Buda khola, in compartments 10, 12 and 18, and on the somewhat extensive flats along the river. The ground is generally scarped and precipitous in the upper basins of the numerous small sots coming down from the main ridge. There is a small lake called Saria Tal in compartment 16. All aspects are well represented except north ones.	Extremely variable.	1,882′–4,109′	Sandstone, the soil being often dry and superficial accompanied in compartments 10—20 with alluvium on the lower slopes.	In compartments 1 and 2, in the best parts of 3 and 4, 9, 10 and 20 and in the higher parts of 11—14 there is a sál pole forest of different ages with some big trees interspersed and often associated with khatbhilawa, sandan, &c.; elsewhere on the less precipitous slopes there is usually a mixed forest of sál, sain, some kokat and khair in places (as in compartments 19 and 20), with the usual accompaniment of bamboos. The upper dry precipitous slopes are badly stocked with bakli, sandan, and bamboos; some banj occurs from about 4,000 feet in compartment 5. The flats in compartments 11 to 14 and in compartment 18 are covered with a nearly pure bamboo forest, containing sál, however near the slopes, but sometimes only grass. There is some khair and shisham along the Nindhaur.	..	..	On precipitous parts 3, elsewhere usually 5—6.	As a rule good and often abundant.	Ditto.
XXVIII—Durga Pipal.	1,997	Contains all the slopes on the south bank of the Nindhaur east of the South Kholgarh block which are included within the forest closed to rights; most of the block is very rugged as in compartments 1, 5 and 9; there is a larger proportion of moderate slopes in compartments 7 and 8, and in compartments 10 and 11 the slopes are usually moderate and fairly uniform, whilst compartment 6 is formed mainly of two shelving plateaux. General aspect north.	In precipitous compartments 20—60°, with frequent scarps; ruling gradient 35° and in compartments 7 and 8, 30°. In compartments 10 and 11, 15°—39°.	2,056′–3,924′	In the west, soil usually sandy, shallow, dry, overlying sandstone and loose conglomerate. On the low plateau in compartment 6 a fine silt, moist nearly always and excellent for shisham. In the east principally pebbles loosely cemented with clayey sand overlying a band of clay which crops out near the surface only at the bottom of the slopes.	Usually an open mixed forest of chír and sál, the former usually predominating except in compartment 8, containing mainly sál and chír poles in proportion of 4 : 1. In compartments 9—11 the proportion of sál to chír varies from 1—2 to 1—5. There are usually broad leaved trees in the ravines. In compartment 6 there is a dense growth of promising mixed shisham below and fairly good mixed sál above, whilst the flat ground in compartment 7 is chiefly grass land.	2—4	...	2·5—7·5, usually 5—7.	Very variable, backward in compartments 1 and 9, elsewhere usually good for chír; fair for sal.	To be fire-protected except compartments, and as many 1st class trees as possible to be worked out save under circumstances mentioned in the plan.

CHAPTER X.

Determination of the annual yield.

69. Having found by means of the enumeration survey the number of sál, sain and chír of the various diameter classes in the working circle, the next important step towards determining the annual yield is to discover the rate of growth of sál in these forests. With this object in view Mr. Brandis selected three sample plots, Lakman Mandi, Sunman Thapla and Amtanola, the two former being in the Chorgalia forests outside the Nindhaur valley, and the third near the Kosi, in order to establish a system of periodical measurements of sál trees of different sizes, and the details of these measurements are given in Appendix C.

The two plots near Chorgalia are situated at an elevation of from 1,000 to 1,200 feet, Sanman Thapla being about 200 feet higher than Lakman Mandi; there is a gentle slope to the south, and the soil is a well drained sandy loam mixed with boulders and rock, whilst the undergrowth consists of high grass and a few bamboos. These plots have not been thinned, pruned or interfered with in any way, nothing whatever being done beyond fencing them and protecting them from fire.

70. The number of trees to the acre is 121 sál and 21 miscellaneous trees, and the results of the measurements of the two plots during the past five years is as follows:—

Name of Plot.	*Annual girth increase per tree in inches.*			*Number of sál trees.*			
	II class 4½′ to 6′ in girth.	III class 3′ to 4½′ in girth.	IV class and under ½′ to 3′ in girth.	II class 4½′ to 6′.	III class 3′ to 4½′	IV class and under ½′ to 3′.	Total.
Lakman Mandi ..	0·60	0·51	0·35	2	20	43	65
Sanman Thapla ...	0·52	0·64	0·28	3	13	39	57 (includes one I class tree).
Average ..	0·56	0·57	0·31	5	33	82	122

From these figures we see that it takes 32 years for a II class tree 4½ feet in girth to pass into the I class, and that it takes almost the same period for a III class tree 3 feet in girth to enter the II class, whereas a IV class tree 1½ feet in girth requires the long period of 58 years to become a III class one. In the latter case, however, a large number of suppressed trees are included in the measurements, and if these are rejected, as we shall see further on, the time is reduced form 58 to 36 years, so that the increase in girth appears to be pretty uniform from the IV to the I class, which means, of course, that the annual volume of wood formed by the average tree increases yearly until a girth of 4½ feet or more has been attained; but owing to the small number of old trees measured the precise point at which the maximum production is reached cannot be determined.

71. In 1884 three other plots of two acres each were chosen in close proximity to the three half acre plots. These two acre plots were heavily thinned by the extraction of 68 sál and 16 miscellaneous trees per acre, leaving 57 sál trees standing on each acre, with sufficient space for the full development of their crowns. It will be seen from the succeeding figures that the thinning consisted principally in the removal of badly grown and suppressed trees of the IV class, so that properly to compare the effect of these thinning operations, the 68 superior sál should be kept separate from the others,

and this has been attempted in the following table, where the trees shown as free or partially so in the half acre plots are those that would probably be left if thinnings were made :—

	Annual girth increase per tree in inches.					Number of sál trees to the acre.						
		III Class.		*IV Class.*			*III Class.*		*IV Class.*		*Total.*	
	II Class.	Free.	Suppressed.	Free.	Suppressed	II Class.	Free.	Suppressed.	Free.	Suppressed.	Free.	Suppressed.
Two acre plots ...	·83	·88	...	·72	...	7	30	...	20	...	57	...
Half acre plots ...	·68	·50	·19	·51	·22	6	31	6	20	62	57	68
Difference ...	+·15	+·38	—·19	+·21	—·22							

72. From these figures it is deduced that by thinning there is a gain per tree annually of ·38 inches in girth on 30 III class trees, and of ·21 inches in girth on 20 IV class trees, whilst there is a loss of ·19 inches on six III class trees and of ·22 inches on 62 IV class trees ; there is also an improvement visible in the growth of the II class trees, but as the number of this class included in the measurements is very small, it will be better to disregard this increase until further measurements have taken place. Apart, therefore, from trees of this class, the proportional increase in volume of the stock in the thinned plots compared with the ones left in a state of nature may be roughly stated as 1·7 to 1·45, so that by judicious thinning operations not only is the quantity of wood annually produced increased, but this increase takes place chiefly in the best and largest trees, instead of being to a considerable extent wasted in the growth of crooked and decaying ones. It is noticeable also that the increase in growth of the thinned plots was much greater in the second year than in the first, which is what might be expected to follow from the development of the crowns of the freed trees Thus, the extraction of such trees is beneficial to the forest, whilst at the same time it improves the revenue, but a sufficient number of IV class trees should be left to replace the III class ones. It must be recollected, however, that the above experiments are by no means conclusive, as they have not yet been continued for a sufficient length of time, and further measurement may tend to modify considerably the present deductions. (Full particulars of these measurements will be found in Appendix C. The figures therein given bring out the interesting fact that sál grows chiefly between May and November, only one-fourth or one-fifth of its annual increase in girth taking place during the remainder of the year.)

73. The valuation survey of the whole of the Working Circle has given these results, which include trees felled since 1880 :—

Name of species.	*I Class, over 2′ in diameter.*		*II Class, 1½′ to 2′ in diameter.*		III Class, 1′ to 1½′ in diameter.	IV Class, ½′ to 1 in diameter.	Total.
	Sound.	Unsound.	Sound.	Unsound.			
Sál	45,963	18,509	112,152	23,817	402,432	1,120,772	1,723,645
Sain	28,765	4,037	40,164	4,824	85,602	115,607	278,999
Chír	8,625	84	14,434	1	21,979	20,693	65,816
Shisham	73	12	640	11	12,472	9,964	23,172
Khair	44	...	273	4	3,679	27,810	31,810
Kaldu (Barmdeo reserve only).	1,739	56	...	...	...	...	1,795
Total ...	85,209	22,698	167,663	28,657	526,164	1,294,846	2,125,237

The proportion between the different classes is for the three most important species—

	I Class.	II Class.	III Class.	IV Class.
Sál ...	1	2	6	17·
Sain ...	1	1·4	2·6	3·5
Chír ...	1	1·7	2·5	2·4

This may be considered satisfactory especially the number of the younger classes of sál, and there can be no danger in extracting as many I class trees as possible within the next 32 years, during which period the whole forest should be worked over.

74. Judging from the results of working in the Salani Khonani North and Khonani South blocks, both Messrs. Wilmot and Bryant, the past and present divisional officers, agree that one-half of the I class trees are available for export. Taking the same ratio for sain and chír, we have—

I Class trees available for export.

Sál	32,000
Sain	16,000
Chír	4,000

Dividing this number by 32, the period in which the whole forest has to be worked over, we find the annual yield in I class trees to be—

Sál	1,000
Sain	500
Chír	100

CHAPTER XI.

The Working Plan.

75. The plan is drawn up on the supposition that selection fellings will be made over the whole of the working circle in a period of 32 years, but detailed work is only prescribed for ten years, after which a revision should be made.

From the figures arrived at in the preceeding chapter it is proposed to limit the annual fellings of I class trees as below :—

	No. of trees.	*Expected yield in cubic feet of wrought timber.*
Sál	1,000	40,000
Sain	500	15,000
Chír	150	12,000

The number of chír it is proposed to fell exceeds the annual yield ; but the blocks which it is intended to work during the next ten years contain a greater portion of this species than the other blocks in the circle, whilst the fellings are arranged solely as regards sál, which is, of course, much the most important species.

76 There are a considerable number of II class trees which have reached maturity whose material it is important to utilise ; therefore a sufficient number of such trees may be cut as will bring the annual yield up to the following quantity .—

	Cubic feet of wrought timber.
Sál	45,000
Sain	18,000
Chír	15,000

77. If, however, it be found that, after working out half the I class trees from any block, more are still available for export, these can be cut in addition to the annual quantity just mentioned, provided that the extra amount so cut yearly shall not exceed—

	No. of trees.	*Cubic feet of wrought timber.*
Sal	1000	40,000
Sain	500	15,000
Chír	150	12,000

78. The following blocks in the Nindhaur valley, together with any timber which may come out of the blocks already partially worked over, will probably supply sufficient timber for the next ten years:—

Name of block.	I class Sál.	I class Sain.	I class Chír.
Aonla Khera North	2,505	1,766	139
Aonla Khera South	2,265	922	322
Gaunia Rau	4,043	1,706	194
Chila	2,954	1,367	740
Kholgarh South	2,473	991	1,332
Kholgarh North	3,159	767	67
Durga Pipal	3,750	579	1,278
Total ...	21,149	8,098	4,072

These blocks should be worked as much as possible in the order named; but, as explained when discussing the past working of the forest, it takes several years before a block can be properly worked out, so that there will probably be always three or four blocks in which work will be going on at the same time, logs being removed from one, scantling from the second and refuse wood from the third. It would not therefore do, to completely work out one block before beginning to tap a second, and the only recommendation to be made is, that the operations should be rendered as regular as possible, but that no steps should be taken with this object in view which would tend to check the demand. The Bhalsani block can also be worked if an export road can be made at a cost which will cause its working to be remunerative.

As a contract for the supply of 20,000 sleepers to the Rájputana-Málwa Railway during the next season has already been made, in addition to the ordinary fellings the balance of 396 sál remaining over from previous years may also be worked out, and if this does not suffice a portion of the following year's yield may be anticipated.

79. Haldu has been valued only in the Barmdeo reserve, and the enumeration elicited the extraordinary fact that there were 1,795 I class trees, but not a single one of the lower classes. As, therefore, there is no chance of this species being produced, and as its place is being taken by the more valuable sál, it will be better to remove all these mature trees as soon as possible, but not in cases where their removal will cause serious damage to the young sál, and it is recommended that they be all sold as soon as a market can be found for them.

80. In selecting the trees to be felled the principles laid down in Mr. Brandis' suggestions of 1881 should be followed, *viz.*, that "all marketable trees above 6 feet in girth, and a proportion of the smaller trees which have attained maturity, may be cut, with the following exceptions:—

"Trees standing on narrow spurs and ridges and on precipitous slopes should be spared; also sál trees standing isolated near blanks, or in a forest of other trees and bamboos. Where the ground is already stocked with young growth, it will be understood that trees may be cut much more freely than where this is not the case Sal must be cut more cautiously on moist shady slopes with a northerly aspect than on the warmer and drier slopes facing the south, where the conditions of natural reproduction are more favourable, and where frost is to be feared."

In the upper blocks, such as Durga Pipal, where there is a considerable quantity of chír mixed with the sál, great precaution should be observed when making fellings of the latter species, and none should be cut where the trees are only scattered amongst the chír unless the reproduction of the species is complete. Caution will also have to be exercised in Aonla Khera South, where there is a great lack of saplings and young poles.

81. *Thinnings.*—In the results obtained from the measurements of the sample plot as detailed in the preceding chapter, the benefical effect of a certain amount of thinning

has been noticed. Considering that there are in most compartments some blanks or bits of open forest, and that the number of other species mixed with sál and sain is generally considerable, it may be concluded that, as a rule, thinnings are required in those compartments with pole forest which contain over 70 sál and sain of 6 inches in diameter and upwards per acre. These compartments are given below :—

Names of compartments.	Number of Sál and Sain trees per acre 6″ in diameter and upwards from—					
	70—79	81—90	90—100	101—110	Exceeding 110	Total above 70.
	Number of compartments.					
Khameri 1	1	...	...	...	...	1
Khopkot 2	1	...	...	...	...	1
Bansa 2, 4	...	...	2	...	...	3
„ 3	...	...	...	...	1	
Naghan 2, 4	...	2	...	...	...	2
Chini 30, 31, 34, 47	4	...	...	...	...	
„ 26	...	1	...	...	...	11
„ 15, 45, 49, 50	...	...	4	...	...	
„ 32, 33	...	...	...	...	2	
Kalaunia E., 1, 7, 14	3	...	...	...	...	4
„ 4	...	...	...	...	1	
Dula Gád 7, 12	2	...	...	...	...	
„ 5, 25, 33	...	3	...	...	...	10
„ 1, 26, 34	...	...	...	3	..	
„ 17, 35	...	...	...	1	2	
Sarra North 8	1	...	...	...	...	1
Balot South 6	...	1	...	...	...	1
Total ...	12	7	6	4	5	34

In addition to these compartments there are several others in the Dula Gád block containing from 60 to 70 sál and sain of 6 inches in diameter and upwards to the acre, together with a very large number of small poles, *e g.*, compartments 24, 28 and 36 and the lower parts of compartments 27, 31 and 32.

82. It is therefore proposed to undertake thinning operations in this block during the next 10 years, and to thin out the following compartments in the same order as they are placed in the table, one compartment being thinned every year ; but 31 and 32, 27 and 28 are to be thinned together :—

Dula Gád Block.

Number of compartment.	Number of acres.	*Number of sál to the acre.*			*Number of sain to the acre.*			Number of sal and sain to the acre.	Remarks.
		I and II classes.	III and IV classes.	Total.	I and II classes.	III and IV classes.	Total.		
36	116	1·56	55·93	57·49	·10	·84	·94	58·43	Large number of young poles below IV class.
35	179	1·38	112·19	113·57	·03	·08	·11	113·68	
34	121	1·82	103·56	105·38	·14	·05	·19	105·57	
33	114	1·96	78·08	80·04	·31	·89	1·20	81·24	
32	122	2·29	36·68	38·97	2·15	3·08	5·23	44·20	Much denser in lower parts.
31	120	1·04	25·57	26 61	2·93	2·57	5·50	32·11	
28	115	3·86	45·84	49·70	3·40	8·28	11·68	61·38	
27	93	2·46	47·13	49·59	2·14	2·94	5·08	54·67	
26	98	3·21	99·24	102·45	·15	·69	·84	103·29	
25	108	1·40	83·42	84·82	·04	·66	·70	85·52	
24	125	0·86	66·61	67·47	·04	·48	·52	67·99	
16	215	2·24	57·21	59·45	·17	·25	·42	59·87	Ditto.
Average ...		1·96	68·27	70·23	·88	1·57	2·45	72·68	

Total area to be worked over 1,535 acres.

Taking into consideration the very large number of young poles in these compartments which have not as yet entered the IV class and hence have not been counted, the thinnings will probably yield at least 3,000 poles a year ; but it must be remembered that the great object in this case is to improve the forest and not to make revenue.

83. Very great care will have to be exercised in marking the poles to be taken out, and this should not be left to any subordinate lower than a ranger, as the whole future of the forest depends on the proper selection of the trees. Those poles only should be marked which are dying or are crooked or injured or otherwise of inferior quality and interfere with the development of their more vigorous neighbours. All completely suppressed poles may also be cut, provided that they are no longer of any service in lengthening the poles of the dominant stems. Care must be taken whilst freeing the crowns of all the healthy trees which have attained their full height, that gaps are not widened, and nothing should be extracted in places where such a course would tend to encourage too much the growth of grass. Kokat trees which are interfering with the growth of sál should be removed, if possible with the sál poles derived from the thinnings.

These thinnings should be persevered with, even if no profit be made from them, but they should not be continued at a loss.

84. *Bamboos.*—The present regulations will probably suffice in the case of these forests, where the demand does not yet exceed the supply, to prevent the bamboo forests deteriorating during the next ten years. The chief point in these regulations is that four uninjured growing stems are to be left in every clump.

85. *Fire-conservancy* —All the blocks in the Nindhaur valley, with the exception of Balot South, Balot North, Sunkheri and compartments 9, 10 and 11 in Durga Pipal, should be fire protected as soon as possible. If this were done the total area under fire protection in the Nindhaur valley would amount to 20,807 acres as compared with 10,107 acres at present, or an increase of 10,700 acres. In addition to this the Dula Gád block, containing 5,311 acres, should also be protected as thinnings are to be made over a portion of the block. For its protection two paths will have to be made from Airideo, the termination of the present path from Bhainsa Dunga. One of these paths, which will be about 5½ miles long, will run down the Bhalia Garbidhar, whilst the second will follow the ridge forming the boundary between the Dula Gád and the Kalaunia West blocks.

The length of fire lines which would be required for the effectual protection of the entire area to be closed would be about—

	Miles.	*Chains.*
Nindhaur	35	0
Dula Gád	13	25
Total ...	48	25

or a mile of fire line for every 540 acres protected as compared with 481 acres at present; and supposing the additional cost to be in proportion to the additional length of fire lines, the annual cost of protecting these 26,118 acres would be about Rs. 2,500 or 1½ annas per acre.

After this has been done the Barmdeo reserve and the other forests in the working circle might be taken in hand consecutively as soon as may be possible.

86. *Climber cutting.*—The best plan would be to take this work up at the rate of a forest a year, and also to clear those compartments each year in which timber operations have been brought to a close, the ground being gone over systematically by a gang of eight coolies under a forest guard. The operation may have to be repeated after a short period.

N. B —A detailed programme of works of improvement is given in Appendix 7.

CHAPTER XII.

INFORMATION TO BE COLLECTED.

87. *Sample plots.*—The measurements of the present sample plots should be continued, and two more should be selected in the middle of the Nindhaur valley, one

on either bank of the stream and about half way between the bed of the river and the main ridge. The data from these plots would probably give more accurate figures regarding the rate of growth of sál in the Working Circle than those obtainable from the present plots which are just outside the hills and thus are growing under different conditions to those which prevail over most of the Working Circle.

88. *Form No.* 2 —In keeping this form all produce exported from the Working Circle should be entered, whether the annual quantity to be extracted is specially prescribed by the working plan or not. In the case of bamboos and other minor produce the quantity brought out from each compartment or from each block could not be entered, but the amount exported from a large basin and passing through a certain chauki could probably be ascertained with sufficient accuracy, *e.g.*, produce from the Nindhaur passing through Chorgalia. Dry wood would also have to be entered in a similar way.

89. In those compartments which are worked over, it is hoped that the officer who marks the trees to be felled will make any alterations or additions to the descriptions given in chapter IX which may appear to be required, and these notes should be of considerable service to the officer who will have to revise the present plan.

90. When all the maps of the recent survey on the scale of four inches to the mile have been published, the compartments, &c., shown on the tracings should be entered on the printed sheets, and the Forest Survey Branch should be requested to send the correct areas of all the blocks and compartments, as for the purposes of the present plan these areas had to be calculated from rough and often crumpled tracings, so that they will often be found inaccurate.

91. When this plan is being revised it will be probably best to include in the Working Circle the other areas of hilly ground in East Kumaun which are closed to rights, consisting of the hills facing the plains and excluded from the present Working Circle.

STATEMENTS.

FORM No. 2.

Register of yield of the Nindhaur hills Working Circle, Kumaun Division.

Block.	Compartment. Numbers.	Compartment. Area in acres.	Class of forest.	Nature of felling	PROVISIONS OF WORKING PLAN. Year of working.	Area to be taken in hand.	Timber and fuel. Number of trees to be felled or girdled.	Timber and fuel. Yield in cubic feet solid. Logs.	Scantlings.	Poles.	Fuel.	Total.	Other forest produce. Kind and quantity.	Revenue. Gross.	Net	RESULT OF OPERATIONS. Area taken in hand.	Timber and fuel. Number of trees felled or girdled.	Yield in cubic feet solid. Logs.	Scantlings.	Poles.	Fuel.	Total.	Other forest produce. Kind and quantity.	Revenue. Gross.	Net.	Remarks.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
															1881-86.											
															SAL.											
XVII—Silani.	1	223	High Forest Sal.	Selection Fellings.	1882	The whole area.	373	...	...	...	...	...	...	...	...	...	86	3,370	304	...	...	3,674	...	...	...	Remove 50,000 cubic feet of sal annually from 1,250 trees, the blocks being worked in the following order:—Silani, Khonani north, Bhalsani, Khonani south Aonla Khera north and Aonla Khera south.
	2	192					207	...	...	...	...	...	...	...	...	...	175	2,016	3,071	...	...	5,087	...	...	...	
	3	104					99	...	...	...	...	...	...	...	...	...	48	1,021	455	...	...	1,476	...	...	...	
	4	244					428	...	...	...	...	...	...	...	...	...	294	9,256	1,799	...	...	11,055	...	...	...	
	5	147					352	...	...	...	...	...	...	...	...	...	98	1,596	1,785	...	...	3,381	...	...	...	
	6	128					182	...	...	...	...	...	...	...	...	...	36	89	581	...	...	670	...	...	...	
	7	139					433	...	...	...	...	...	...	...	...	...	90	3,388	314	...	...	3,702	...	...	...	
	8	224					315	...	...	...	...	...	...	...	...	...	69	91	1,544	...	...	1,635	...	...	...	
	9	234					256	...	...	...	...	...	...	...	...	...	116	87	4,069	...	...	4,156	...	...	...	
	10	176					405	...	...	...	...	...	...	...	...	...	276	6,888	4,875	...	...	11,763	...	...	...	
		1,811					3,050	...	...	...	...	...	...	...	...	...	1,288	27,802	18,797	...	...	46,599	...	...	..	
XVIII.—Khonani, S.	1	197					308	...	...	...	...	...	...	...	...	...	67	...	2,398	...	...	2,398	...	...	...	
	2	259					273	...	...	...	...	...	...	...	...	...	18	1,133	...	...	...	1,133	...	...	...	
	3	242					763	...	...	...	...	...	...	...	...	...	380	4,768	8,750	...	...	13,518	...	...	...	
	4	156					317	...	...	...	...	...	...	...	...	...	185	5,537	3,038	...	...	8,575	...	...	...	
	5	196					398	...	...	...	...	...	...	...	...	...	94	1,710	2,310	...	...	4,020	...	...	...	
	6	204					726	...	...	...	...	...	...	...	...	...	211	...	6,639	...	...	6,639	...	...	...	
	7	278					665	...	...	...	...	...	...	...	...	...	120	...	6,053	...	...	6,053	...	...	..	
		1,532					3,450	...	...	...	...	...	...	...	...	...	1,070	13,148	29,188	...	...	42,336	...	...	...	

LIBRARY

FORM No. 2.

Register of yield of the Nindhaur hills Working Circle, Kumaun Division—(continued).

Block.	Compartment. Numbers.	Compartment. Area in acres.	Class of forest.	Nature of felling.	PROVISIONS OF WORKING PLAN. Year of working.	Area to be taken in hand.	Timber and fuel. Number of trees to be felled or girdled.	Timber and fuel. Yield in cubic feet, solid. Logs.	Scantlings.	Poles.	Fuel.	Total	Other forest produce. Kind and quantity.	Revenue. Gross.	Net.	RESULT OF OPERATIONS. Area taken in hand.	Timber and fuel. Number of trees felled or girdled.	Yield in cubic feet solid. Logs.	Scantlings.	Poles.	Fuel.	Total.	Other forest produce. Kind and quantity.	Revenue. Gross	Net	Remarks.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
																1881-86. SAL.										
XIX.—Khonani North.	1	124	High forest sal.	Selection fellings.		The whole area.	158	...	...	...	...	...	...	...	...	...	296	2,677	6,615	...	...	9,292	...	...	...	The figures in column 8 are taken from the Enumeration Survey and are the total of 2 columns, *viz.* trees above six feet in girth sound and unsound. It will be seen that the number of trees in column 18 sometimes exceeds that in column 8. It must be remembered that the data to write up this statement were collected sometime after the fellings took place, as until the spring of 1885 there were no block or compartment maps available. It may be taken that in terms of the memo. of working some mature second class trees were felled; but if the discrepancies are too great, they must be put down to inaccurate memory, failing to recall the number of trees felled in each compartment when the arrival of the maps permitted the boundaries to be distinguished.
	2	137					213	...	...	...	...	...	...	...	...	...	129	1,381	3,448	...	...	4,829	...	...	...	
	3	125					268	...	...	...	...	...	...	...	...	...	94	1,623	1,750	...	...	3,373	...	...	...	
	4	218					110	...	...	...	...	...	...	...	...	...	287	1,768	7,554	...	..	9,322	...	...	...	
	5	183					304	...	...	...	...	...	...	...	...	...	319	5,250	5,405	...	...	10,655	...	...	...	
	6	174					222	...	...	...	...	...	...	...	...	...	330	3,450	7,049	...	...	10,490	...	...	...	
	7	112					104	...	...	...	...	...	...	...	...	...	58	954	1,477	...	..	2,431	...	...	...	
	8	195					341	...	...	...	...	...	...	...	...	...	133	4,772	1,114	...	...	5,886	...	...	...	
	9	243					354	...	...	...	...	...	...	...	...	...	132	5,297	922	...	...	6,219	...	...	...	
		1,511					2,074	...	...	...	...	...	...	...	...	...	1,778	27,172	35,325	...	...	62,497	..	...	...	
XXI.—Bhalsani.	3	186					307	...	...	...	...	...	...	...	...	...	83	...	2,528	...	...	2,528	...	...	...	
	4	298					437	...	...	...	...	...	...	...	...	...	41	...	1,287	...	...	1,287	...	...	...	
	5	125					146	...	...	...	...	...	...	...	...	...	3	...	252	...	...	252	...	...	...	
		609					890	...	...	...	...	...	...	...	...	...	127	...	4,067	...	...	4,067	...	...	...	
XXIII.—Aonla Khera South.	1	262					394	...	...	...	...	...	...	...	...	...	246	5,520	5,250	...	...	10,770	...	...	...	
	2	147					459	...	...	...	...	...	...	...	...	...	87	866	2,573	...	...	3,439	...	...	...	
	3	215					519	...	...	...	...	...	...	...	...	...	336	...	123	...	...	123	...	...	...	
		624					1,372	...	...	...	...	...	...	...	...	...	...	6,386	7,946	...	...	14,332	...	...	...	

| | | |

APPENDIX A.

Abstract of Revenue realised at Chaukis during 1884-85.

Number.	Produce.	*Chorgalia.*		*Ransali.*		*Sadlimat.*		*Kilpura.*		*Chandani.*		*Tanakhur..*		TOTAL.	
		Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.
			Rs.		Rs.		Rs.		Rs.		Rs.		Rs.		Rs.
1	Timber ... cubic feet.	56,638	23,376	5,720	1,672	25,100	7,191	35,402	6,523	24,132	5,305	6,525	1,707	153,521	45,774
2	Firewood	...	292	...	72	...	...	...	56	...	27	...	...	...	451
3	Bamboos ... scores.	8,782	840	5,934	540	5,962	538	26,683	2,417	19,358	1,750	12,423	1,138	79,142	7,213
4	Grazing dues and fodder grass ...	...	302	...	84	...	17	...	25	...	65	...	...	...	493
5	Minor produce	...	297	...	333	...	53	...	257	...	76	...	222	...	1,238
	Total ...	...	25,107	...	2,701	...	7,803	...	9,278	44,490	7,223	...	3,067	...	55,169
						Particulars of the timber exported.									
1	Sál, green	22,140	14,442	11	6	555	136	333	106	787	81	28	2	23,854	14,773
2	„ dry	14,539	5,473	650	107	947	104	8,518	784	9,910	1,830	439	142	35,003	8,450
3	Sain, green	4,525	1,568	4,737	1,481	3,673	1,148	386	121	...	...	...	...	13,321	4,318
4	„ dry	207	39	...	...	...	...	...	...	...	...	9	3	216	42
5	Shisham, green	...	...	...	...	...	...	66	20	6,313	1,506	...	...	6,379	1,526
6	„ dry	1,056	330	118	28	7	3	526	154	2,445	669	450	165	4,612	1,349
7	Sandan, dry	52	16	..	...	...	...	...	...	...	...	...	...	52	16
8	Tun, green	...	...	...	...	...	...	656	205	...	...	...	...	656	205
9	„ dry	11	4	97	30	...	...	...	...	273	43	267	37	648	114
10	Huldu and Dhauri, green ...	1,670	602	...	...	17,981	5,619	12,776	3,992	3,339	916	5,165	1,315	40,931	12,444
11	„ dry ...	134	19	73	15	11	1	18	3	494	119	46	6	776	163
12	Khair, green	...	..	..	...	...	...	...	...	17	4	...	...	17	4
13	„ dry	120	30	6	2	...	...	3	1	363	83	52	19	544	135
14	Chír, green	1,263	158	..	...	...	...	...	...	...	...	...	...	1,263	158
15	„ dry	132	17	..	..	...	...	...	...	...	...	...	7	139	18
16	Bijasal, dry	...	...	...	...	...	...	...	...	162	47	62	18	224	65
17	Katruk, green	...	...	8	1	...	...	16	2	...	...	...	...	24	3
18	„ dry	...	...	20	2	...	...	...	...	...	...	...	...	20	2
19	Amaltas, green	...	...	...	...	..	...	...	...	9	2	...	...	9	2
20	„ dry	...	...	..	...	...	...	...	...	20	5	..	...	20	5
21	Simal, green	10,789	678	...	...	1,926	180	12,104	1,135	...	...	...	...	24,819	1,993
	Total ...	56,638	23,376	5,720	1,672	25.100	7,191	35.402	6,523	24,132	5,305	6 525	1,708	153,517	45,775

The principal items of minor produce were—

Skins	No.	2,442	Matting	Yds.	2,329
Horns	„	2,449	Pipla Mor	Mds.	123
Kaphal bark,	Mds.	95	Honey	„	68
Lodh „	„	77	Wax	„	44
Baskets	No.	54,814			

APPENDIX B.

Table of Contents of Compartments.

Block.	Number of compartment.	Area valued in acres.	Sal.							Sain.							Chir.							Total.
			IV. Class.	III. Class.	II. Class.		I. Class.		Total.	IV. Class.	III. Class.	II. Class.		I. Class.		Total.	IV. Class.	III. Class.	II. Class.		I. Class.		Total.	
					Sound.	Unsound.	Sound.	Unsound.				Sound.	Unsound.	Sound.	Unsound.				Sound.	Unsound.	Sound.	Unsound.		
I.—Jariakhal South,	1	295	9,780	2,041	1,053	39	630	81	13,624	40	48	29	...	23	...	140	...	...	...	...	...	...	...	
	2	197	4,564	2,180	1,078	142	411	130	8,505	18	23	15	...	14	3	73	...	...	...	...	...	...	...	
	3	240	8,100	1,550	675	31	323	42	10,721	28	21	8	...	5	3	65	1	...	...	...	...	...	...	
	4	194	5,823	1,835	723	37	427	49	8,894	43	70	41	1	43	6	204	2	1	...	...	...	...	...	3
	5	174	4,541	2,433	535	85	303	117	8,014	61	56	36	8	58	13	232	...	...	...	...	...	...	...	
Total ...	...	1,100	32,808	10,039	4,064	334	2,094	419	49,758	190	218	129	9	143	25	714	2	1	...	...	...	..		3
II.—Jariakhal North	No compartments.						Has not been valued.																	
III.—Khamari ...	1	268	16,506	2,386	247	16	78	11	19,244	176	212	128	5	156	2	679	...	...	...	...	...	...	...	
	2	102	3,274	680	110	4	15	3	4,092	40	71	67	2	110	3	293	...	...	...	...	...	...	...	
	3	112	1,879	878	199	27	71	13	3,068	67	75	80	...	136	4	362	...	...	...	...	...	...	...	
	4	73	461	210	37	1	7	...	716	24	21	20	...	34	3	102	...	...	...	...	...	...	...	
	5	55	143	114	29	6	7	1	300	4	11	7	...	9	...	31	...	...	...	...	...	...	...	
Total ...	...	610	22,263	4,275	622	54	178	28	27,420	311	390	302	7	445	12	1,467	..	..	...	...	...	...	...	
IV.—Khapkot ...	1	50	...	..	...	...	...	...	...	15	...	...	...	...	...	15	..	...	...	...	...	...	...	
	2	264	12,331	5,040	710	135	93	77	18,386	444	311	154	9	118	5	1,041	3	25	18	...	5	...		51
	3	119	1,292	1,328	249	62	35	14	2,980	577	275	110	1	103	2	1,068	3	11	7	...	...	...		21
Total ...	...	433	13,623	6,368	959	197	128	91	21,366	1,036	586	254	10	221	7	2,124	6	36	25	...	5	...		72
V.—Bansa ...	1	175	9,740	1,639	212	28	40	16	11,675	18	11	17	3	47	1	97	...	...	...	...	...	...	...	
	2	241	18,365	3,125	214	147	52	65	21,968	8	13	10	2	9	2	44	...	...	...	...	...	...	...	
	3	135	13,803	2,388	225	23	35	48	16,522	65	71	31	1	41	...	209	...	..	...	...	...	...	...	
	4	129	8,463	3,196	293	29	103	20	12,104	80	156	111	3	145	4	499	...	...	...	...	...	...	...	
	5	123	1,219	545	69	7	15	8	1,863	120	154	146	...	218	...	638	...	...	...	...	...	...	...	
Total ...	...	803	51,590	10,893	1,013	234	245	157	64,132	291	405	315	9	460	7	1,487	...	...	...	...	...	...	...	

APPENDIX B.

Table of Contents of Compartments—(continued).

Block.	Number of compartments.	Area valued in acres.	Sal. IV. Class.	Sal. III. Class.	Sal. II. Class. Sound.	Sal. II. Class. Unsound.	Sal. I. Class. Sound.	Sal. I. Class. Unsound.	Sal. Total.	Sain. IV. Class.	Sain. III. Class.	Sain. II. Class. Sound.	Sain. II. Class. Unsound.	Sain. I. Class. Sound.	Sain. I. Class. Unsound.	Sain. Total.	Chir. IV. Class.	Chir. III. Class.	Chir. II. Class. Sound.	Chir. II. Class. Unsound.	Chir. I. Class. Sound.	Chir. I. Class. Unsound.	Total.
VI.—Naghan ...	1	157	895	135	29	2	3	...	1,064	105	59	70	1	112	...	347	...	...	...	...	...	...	...
	2	114	9,002	904	95	5	28	14	10,048	49	8	9	1	71	5	143	..	...	...	...	...	...	...
	3	97	1,813	280	86	1	19	...	2,199	7	5	8	...	21	...	41	...	...	...	...	...	.	...
	4	214	14,910	2,982	328	23	60	21	18,324	61	21	14	2	38	3	139		...	...	...	...	...	...
	5	104	2,065	1,077	148	20	44	15	3,369	113	183	134	1	84	3	518	...	.	..	...	...	...	...
Total ...	...	686	28,685	5,378	686	51	154	50	35,004	335	276	235	5	326	11	1,188	...	...	...	...	..	..	...
VII.—Dangaona ...	1	153	2,630	132	20	...	5	2	2,809	1	...	...	...	3	...	4	..	...	...	...	...	...	...
	2	158	6,379	465	61	8	10	5	6,928	9	4	1	...	...	...	14	...	...	...	...	...	...	...
	3	185	1,515	189	11	5	1	4	1,725	7	5	2	...	12	...	26	...	...	..	...	...	...	...
	4	139	13	3	1	...	...	...	17	15	12	...	...	20	...	47	...	...	..	...	...	...	...
	5	190	85	41	15	..	4	1	146	21	15	16	...	64	...	116	.	...	...	...	...	...	...
Total ...	...	825	10,642	830	108	13	20	12	11,625	53	36	19	...	99	...	207	...	...	...	...	...	...	...
	1								Not valued.														
	2								Ditto.														
	3								Ditto.														
	4								Ditto.														
	5	185	2,227	1,074	431	52	271	39	4,094	102	86	40	3	47	6	284	115	157	131	...	62	...	465
	6	174	1,855	866	396	44	209	41	3,411	1,238	758	285	33	212	7	2,533	51	53	28	...	20	...	152
	7	140	642	503	114	70	44	33	1,406	654	472	189	27	108	9	1,459	26	29	14	...	1	...	70
	8	226	2,179	467	106	53	36	58	2,899	69	83	133	6	161	11	463	1	1	...	...	...	...	2
	9	240	8,558	1,762	391	134	82	107	11,034	400	289	162	24	200	25	1,100	2	3	...	...	...	...	5
	10	156	2,155	1,098	160	121	26	38	3,598	1,257	888	182	32	59	4	2,422	27	34	10	...	3	...	74
	11								Not valued.														
	12	154	2,201	1,147	390	181	131	126	4,176	582	459	262	43	232	43	1,621	6	14	9	...	1	...	30
	13	73	2,580	1,273	161	203	14	79	4,310	262	263	123	15	60	6	729	...	..	...	...	...	...	...
	14	108	3,421	1 148	228	131	30	84	5,042	14	64	78	10	150	21	337	...	...	...	...	...	...	...
	15	444	38,518	3.503	404	105	79	116	42,725	7	2	2	...	12	1	24	...	...	...	...	...	...	...
	16	149	7,014	2,420	279	219	45	88	10,065	45	84	71	18	55	10	283	...	...	...	...	...	...	...
	17	183	9,730	2,507	346	297	50	144	13,074	196	159	109	14	84	6	568	...	...	...	...	..	...	...
	18	137	3,528	1,642	303	251	44	85	5,853	355	361	238	18	131	12	1,115	8	1	...	...	...	...	9
	19	171	2,700	1,624	293	90	73	48	4,828	1,256	1,073	358	26	208	17	2,938	...	...	...	...	...	...	...
	20								Not valued.														
	21	148	2,712	887	348	67	134	66	4,214	1,428	555	228	33	118	28	2,390	34	39	17	...	2	...	92
	22	175	5,304	1,557	295	81	86	59	7,382	1,699	818	216	24	99	14	2,870	6	25	27	...	10	...	68
	23	135	1,897	1,039	342	123	104	118	3,623	341	451	270	24	189	17	1,292	...	...	1	...	1	...	2

VIII.—Chini ...	24	131	2,318	1,526	275	112	61	98	4,390	184	405	164	21	102	10	886	...	...	...	...	...	...	...
	25	96	2,305	500	146	60	75	47	3,133	262	168	78	5	126	11	650	...	...	...	...	...	...	...
	26	95	4,310	1,500	344	177	146	100	6,577	850	392	93	9	61	9	1,414	3	...	...	...	...	...	3
	27	96	1,831	856	267	92	100	129	3,275	275	190	56	3	41	14	579	6	3	4	...	...	...	13
	28	82	1,142	635	234	97	38	74	2,220	60	78	67	9	90	18	322	...	...	...	...	..	..	...
	29	182	7,211	1,907	317	179	68	126	9 808	32	27	22	6	34	8	129	...	...	...	...	...	...	...
	30	236	13,079	2,554	427	405	95	219	16,779	164	112	75	16	122	25	514	...	...	...	...	...	...	...
	31	125	7,281	1,223	270	222	25	113	9,134	18	22	31	9	38	5	123	...	...	...	...	...	...	...
	32	153	15,746	1,331	128	100	8	81	17,394	28	3	1	...	4	2	38	...	...	...	...	...	...	...
	33	169	16,560	1,448	186	179	41	130	18,547	32	10	2	1	7	2	54	...	...	...	...	...	...	...
	34	131	8,109	1,430	219	115	40	94	10,007	10	9	5	...	16	1	41	...	...	...	...	...	...	...
	35	127	3,147	811	244	110	77	70	4,459	186	211	138	7	143	16	701	...	...	...	...	...	...	...
	36	150	5,187	2,079	283	170	29	87	7,835	980	604	259	30	108	29	2,010	...	...	...	...	...	...	...
	37	149	4,112	1,679	336	161	83	95	6,466	809	889	144	30	179	20	1,571	...	...	...	...	...	...	...
	38							Not valued.															
	39							Ditto.															
	40							Ditto.															
	41	107	2,886	1,301	286	141	80	126	4,820	316	295	200	25	111	21	968	...	...	...	...	...	...	...
	42	114	4,535	1,246	249	178	56	85	6,349	241	131	130	14	92	19	627	...	...	...	...	...	...	...
	43	153	6,762	1,683	269	85	68	127	8,994	74	36	19	4	47	9	189	...	...	...	...	...	...	...
	44	94	4,563	1,233	221	74	81	74	6,246	54	44	38	7	80	14	237	...	...	...	...	...	...	...
	45	103	7,390	1,298	152	205	29	83	9,187	446	214	153	35	114	20	982	...	...	...	...	...	...	...
	46	88	3,456	814	157	53	68	103	4,651	69	21	67	4	151	9	321	...	...	...	...	...	...	...
	47	103	5,252	1,269	242	105	72	147	7,087	47	77	48	4	55	5	236	...	...	...	...	...	...	...
	48	117	5,588	427	64	31	25	36	6,171	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	49	93	6,280	1,891	155	69	24	38	8,457	52	873	46	3	29	6	219	...	...	...	...	...	...	..
	50	104	5,614	1,005	177	73	80	105	7,054	35	36	34	...	35	6	146	...	...	...	...	...	...	...
	51	119	9,284	1,552	151	93	21	87	11,108	15	3	...	1	5	1	25	...	...	...	...	...	...	...
	52	112	10,273	1,143	134	54	41	51	11,696	7	3	...	...	9	...	19	...	...	...	...	...	...	...
Total ...	..	6,227	2,61,442	58,858	10,950	5,562	2,992	3,854	3,43,698	15,151	10,428	4,816	593	3,924	517	35,429	285	359	241	...	100	...	985
IX.—Kalaunia East...	1	161	10,078	1,173	96	38	27	46	11,458	36	22	19	1	45	5	128	..	...	...	...	...	...	...
	2	129	4,282	1,564	296	34	32	21	6,229	21	8	1	...	2	.	32	...	..	...	...	...	...	...
	3	129	5,478	1,915	273	23	49	20	7,758	2	...	...	...	...	...	2	...	...	...	...	...	...	...
	4	131	11,316	1,384	152	82	28	85	13,047	164	104	73	8	133	15	497	...	...	...	...	...	...	...
	5	206	6,919	931	29	29	17	22	7,947	402	65	34	4	82	16	603	...	...	...	...	...	...	...
	6	210	9,143	1,298	123	138	16	102	10,820	879	430	182	43	134	30	1,698	..	...	...	...	...	...	...
	7	161	3,148	664	111	44	19	30	4,016	867	417	167	12	105	17	1,585	...	...	...	...	...	...	...
	8	219	3,190	1,875	292	208	34	105	5,704	849	797	358	48	174	20	2,246	...	..	...	...	...	...	...
	9							Not valued.															
	10	148	913	81	348	116	253	107	1,818	158	263	203	34	183	32	878	...	1	1	...	...	...	2
	11	244	3,349	2,016	831	99	550	72	6,917	719	694	377	49	333	49	2,221	...	...	...	...	2	...	2
	12	174	5,352	2,036	473	73	451	49	8,434	701	459	232	12	242	25	1,671	5	11	7	...	4	...	27
	13	166	4,196	1,083	272	23	140	24	5,738	580	360	230	15	158	16	1,359	130	221	107	...	52	...	510
	14	195	2,299	2,182	370	88	97	35	12,071	1,326	454	142	20	74	11	2,027	110	209	251	...	75	...	645
	15	130	5,267	1,307	211	27	80	30	6,922	82	43	7	1	7	2	142	134	212	163	...	151	...	660
	16	144	4,374	1,135	119	22	44	5	5,699	1,518	533	107	11	31	6	2,206	292	302	77	...	48	...	719
	17							Not valued															
	18	74	821	404	132	14	42	8	1,421	524	394	150	7	68	6	1,149	1	...	...	...	...	...	1
	19	136	3,915	980	230	38	103	20	5,286	551	238	86	8	49	3	935	...	...	1	...	...	...	1
	20	139	3,173	1,253	256	16	70	13	4,781	408	263	128	7	78	9	893	6	6	3	...	...	...	15
	21	127	2,005	793	202	24	103	22	3,149	321	291	127	11	91	12	853	17	35	30	...	34	...	116
	22	98	2,089	708	189	34	47	10	3,077	586	438	179	12	44	16	1,275	63	78	31	...	3	...	175
Total .		3,121	98,307	24,782	5,005	1,170	2,202	823	1,32,292	10,694	6,278	2,802	303	2,033	290	22,400	758	1,075	671	...	369	...	2,873

APPENDIX B.

Table of Contents of Compartment—(continued).

Block.	Number of compartments.	Area valued in acres.	Sal. IV. Class.	Sal. III. Class.	Sal. II Class. Sound.	Sal. II Class. Unsound.	Sal. I. Class. Sound.	Sal. I. Class. Unsound.	Sal. Total.	Sain. IV. Class.	Sain. III. Class.	Sain. II. Class. Sound.	Sain. II. Class. Unsound.	Sain. I. Class. Sound.	Sain. I. Class. Unsound.	Sain. Total.	Chir. IV. Class.	Chir. III. Class.	Chir. II. Class. Sound.	Chir. II. Class. Unsound.	Chir. I. Class. Sound.	Chir. I. Class. Unsound.	Chir. Total.
X.—Kalaunia West ...	1						Not valued.																
	2	159	2,529	815	300	43	162	55	3,904	256	162	108	13	81	11	631	14	10	4	...	5	...	33
	3	166	1,743	613	134	45	70	41	2,646	813	478	141	21	65	14	1,532	11	1	...	...	...	...	12
	4	152	831	421	192	60	116	73	1,693	307	303	170	16	83	19	898	11	10	1	...	...	...	22
	5	115	1,011	636	228	21	74	13	1,983	368	312	99	9	46	4	838	22	14	23	...	22	...	81
	6	151	1,441	822	284	25	120	29	2,721	484	278	91	9	53	2	917	118	100	139	...	173	...	530
	7	108	2,922	1,224	388	62	114	22	4,732	500	406	106	9	42	3	1,066	42	44	30	...	2	...	118
	8	156	3,442	2,280	740	116	271	91	6,940	299	425	110	27	110	14	985	22	18	17	...	15	...	72
	9	192	1,421	1,145	433	51	259	40	3,329	306	418	233	13	173	18	1,161	128	51	43	...	12	...	234
	10	146	2,227	1,703	513	183	246	81	4,953	703	513	277	41	171	16	1,721	62	74	54	...	11	...	201
	11						Not valued.																
	12						Ditto.																
	13	135	733	97	11	9	6	81	864	281	185	81	7	100	9	663	...	...	...	...	...	...	...
	14						Not valued.																
	15	94	714	350	89	59	23	36	1,271	251	239	119	25	100	12	746	3	...	4	...	2	...	9
Total ...	...	1,574	19,014	10,106	3,312	654	1,461	489	35,036	4,568	3,719	1,535	190	1,024	122	11,158	433	322	315	...	242	...	1,312
	1	199	17,144	3,047	242	65	41	50	20,589	223	43	21	3	45	6	341	...	...	...	...	...	...	...
	2	158	4,659	1,460	141	144	20	44	6,468	937	551	232	23	153	17	1,913	55	66	30	...	1	...	152
	3	92	2,199	774	130	60	54	38	3,255	553	324	107	11	126	3	1,124	16	32	36	...	10	...	94
	4	117	3,616	1,195	265	77	62	103	5,318	266	282	265	48	215	30	1,106	...	...	...	...	...	...	...
	5	137	8,662	1,929	302	113	66	125	11,197	123	35	45	11	81	23	318	...	...	...	...	...	...	...
	6	447	9,800	3,852	681	89	135	75	14,722	29	5	...	...	...	...	34	...	...	...	...	...	...	...
	7	276	13,487	4,808	902	33	145	71	19,446	57	11	1	...	2	1	72	...	...	...	...	...	...	...
	8	157	6,347	1,996	357	144	53	101	8,998	147	102	83	22	65	22	441	...	...	...	...	...	...	...
	9	138	5,546	1,677	255	158	64	114	7,814	489	472	206	33	105	13	1,318	...	...	...	...	...	...	...
	10	143	3,441	1,282	250	217	48	147	5,385	458	401	139	30	58	22	1,108	...	...	...	...	...	...	...
	11	113	3,653	1,196	310	125	65	121	5,470	107	75	35	10	48	13	286	...	...	...	...	...	...	...
	12	129	6,221	1,785	215	105	38	95	8,459	154	49	33	7	65	16	324	...	...	...	...	...	...	...
	13	72	2,942	639	103	84	22	86	3,876	13	19	20	9	46	8	112	...	...	...	...	...	...	...
	14	146	8,578	1,050	75	41	20	50	9,814	361	29	4	3	9	6	412	...	...	...	...	...	...	...
	15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	16	215	10,755	1,546	226	91	37	128	12,783	43	21	9	4	19	5	101	...	...	...	...	...	...	...
	17	76	6,156	1,441	217	182	37	121	8,154	306	227	122	22	120	25	822	...	...	...	...	...	...	...

XI.—Dala Gal ...	18	163	2,282	634	96	60	32	49	3,153	1,049	814	286	28	146	31	2,354	47	12	2	...	1	...	62
	19	114	1,422	929	288	87	67	59	2,852	968	573	167	9	105	10	1,852	63	85	69	...	34	...	251
	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	21	188	3,601	1,984	428	134	170	104	6,421	1,136	832	316	39	191	15	2,529	...	2	6	...	1	...	9
	22	161	3,195	1,287	342	136	106	131	5,197	518	464	261	46	242	48	1,579	...	...	...	...	...	...	...
	23	130	5,512	1,241	167	154	36	99	7,209	192	183	83	16	83	12	569	..	...	...	..	...	...	...
	24	125	7,772	555	41	29	10	28	8,435	54	6	...	1	3	1	65	...	...	...	...	...	...	...
	25	108	8,000	1,010	62	41	9	39	9,161	60	11	2	...	2	1	76	...	...	...	...	...	...	...
	26	98	8,290	1,436	165	78	22	50	10,041	60	8	4	...	6	5	83	...	...	..	...	...	...	...
	27	93	3,545	845	110	54	13	52	4,619	146	128	83	14	95	12	473	...	...	...	...	...	...	...
	28	115	3,666	1,606	165	181	24	76	5,718	505	447	203	30	122	36	1,343	...	...	...	...	...	...	...
	29	122	1,726	672	128	93	36	74	2,729	660	486	185	27	133	33	1,524	...	...	...	...	...	...	...
	30	136	3,571	896	130	109	25	93	4,824	393	228	127	25	109	19	901	...	...	...	...	...	...	...
	31	129	2,833	466	57	37	16	25	3,434	126	206	105	14	233	26	710	...	...	...	...	...	...	...
	32	122	3,560	915	154	60	19	47	4,755	260	116	97	13	127	26	639	...	...	...	...	...	...	...
	33	114	7,732	1,169	133	43	16	32	9,125	86	16	14	4	13	5	138	...	...	...	...	...	...	...
	34	121	11,428	1,103	87	59	13	61	12,751	5	2	5	2	9	1	24	...	...	...	...	...	...	...
	35	179	18,700	1,383	152	39	25	32	20,331	13	1	...	1	5	...	20	...	...	...	...	...	...	...
	36	116	5,820	668	82	61	12	26	6.669	79	19	4	2	6	...	110	...	...	...	...	...	...	...
Total ...	...	4,949	215,951	48,476	7,458	3,183	1,558	2,546	279,172	10,576	7,186	3,284	507	2,777	491	24,821	181	197	143	...	47	...	568
XI.—Sarra North ...	1	168	4,000	2,618	583	291	90	115	7,697	806	191	17	7	3	...	1,024	869	552	131	...	13	...	1,565
	2	226	4,987	3,879	1,072	326	243	135	10,642	887	437	92	15	25	8	1,464	236	321	150	...	40	...	747
	3	234	7,221	4,210	1,096	392	264	204	13,387	618	251	90	20	60	17	1,056	94	99	66	...	35	...	294
	4	143	3,738	1,966	540	137	175	72	6,628	358	194	75	5	69	11	712	116	135	33	...	9	...	293
	5	197	5,272	2,689	613	244	187	153	9,158	212	154	76	9	67	11	529	112	87	26	...	9	...	234
	6	126	4,099	1,759	463	123	138	83	6,665	161	126	89	24	87	18	505	25	34	15	...	1	...	75
	7	146	4,122	1,427	486	41	156	50	6,282	111	92	71	8	64	11	357	1	9	6	...	...	...	16
	8	140	7,303	1,7-1	488	49	291	100	10,012	121	20	15	3	34	8	201	5	...	...	...	...	...	5
	9	205	10,709	3,351	1,205	110	588	180	16,143	508	294	192	8	229	29	1,260	44	9	5	..	2	...	60
	10	190																					
	11	184	3,116	573	208	46	151	132	4,226	154	99	67	11	106	3	440	...	...	4	...	2	...	6
	12	147	3,313	988	365	73	248	75	5,062	101	100	68	...	85	3	357	...	...	...	...	...	...	...
	13	212	2,107	840	264	34	188	29	3,462	182	97	96	12	109	5	501	5	5	...	...	...	...	10
	14	246	1,734	1,385	667	35	539	41	4,401	94	85	84	3	74	7	347	...	1	1	...	1	...	3
	15	266	2,173	788	179	18	105	25	3,288	112	74	69	4	132	5	396	2	1	2	...	4	...	9
	16	221	11,139	1,647	494	111	221	104	13,716	371	257	127	6	78	12	851	6	6	4	...	2	...	18
	17	57	439	282	98	27	54	23	923	181	119	31	2	36	3	372	...	...	...	...	...	...	...
	18	87	1,122	461	231	16	95	26	1,951	112	78	59	7	74	15	345	..	...	...	...	...	...	...
	19	122	1,532	1,478	465	64	181	44	3,764	415	241	104	11	73	4	848	4	14	1	...	...	...	19
	20	97	2,045	1,359	372	154	94	71	4,095	227	173	83	13	64	16	576	6	6	1	...	...	..	13
	21	226	4,532	3,448	762	225	209	111	9,287	331	309	141	14	104	14	913	3	15	6	...	1	...	25
	22									Not valued.										...		...	
	23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	24	267	6,552	1,508	270	72	79	36	8,517	1,171	466	230	50	200	42	2,159	10	23	17	...	4	...	54
	25	222	5,036	1,238	238	74	97	47	6,730	600	276	161	18	105	14	1,174	3	...	...	...	...	...	3
Total ...	...	4,129	96,291	39,675	11,159	2,662	4,393	1,856	156,036	7,833	4,133	2,037	250	1,878	256	16,387	1,541	1,317	468	...	123	...	3,449

APPENDIX B.

Table of Contents of Compartments—(continued).

Block.	Number of compartments.	Area valued in acres.	Sál. IV. Class.	Sál. III. Class.	Sál. II. Class. Sound.	Sál. II. Class. Unsound.	Sál. I. Class. Sound.	Sál. I. Class. Unsound.	Sál. Total.	Sain. IV. Class.	Sain. III. Class.	Sain. II. Class. Sound.	Sain. II. Class. Unsound.	Sain. I. Class. Sound.	Sain. I. Class. Unsound.	Sain. Totol.	Chir. IV. Class.	Chir. III. Class.	Chir. II. Class. Sound.	Chir. II. Class. Unsound.	Chir. I. Class. Sound.	Chir. I. Class. Unsound	Total.
XII.—Sarra South ...	1	216	1,217	822	248	63	87	41	2,478	453	198	62	14	24	3	754	755	764	565	...	154	79	2,317
	2	187	1,098	817	425	119	175	60	2,694	410	225	113	16	37	10	811	388	346	408	...	173	...	1,315
	3	274	1,646	1,146	663	161	366	188	4,170	517	326	137	24	104	11	1,119	543	621	555	...	223	...	1,942
	4	280	1,841	1,058	425	51	221	53	3,649	324	204	96	21	48	14	707	191	258	153	...	73	...	681
	5	140	644	385	136	32	42	12	1,254	277	234	144	5	51	2	713	191	330	262	...	134	...	917
	6	289	2,347	1,461	413	111	247	72	4,651	451	393	202	8	115	7	1,176	144	288	230	...	207	...	875
	7	208	1,937	1,111	402	140	195	72	3,857	481	349	176	18	68	11	1,103	350	284	233	...	144	...	911
	8	175	1,405	812	399	90	174	55	2,935	296	173	95	8	67	7	646	231	186	143	...	69	...	629
	9	226	1,888	1,010	509	127	232	68	3,834	548	312	214	22	134	12	1,242	258	219	162	...	96	2	737
	10	335	2,758	1,725	816	104	621	139	6,163	624	446	262	28	225	31	1,616	337	348	224	...	195	...	1,104
	11	283	1,394	1,199	457	46	302	31	3,429	624	524	233	14	118	10	1,523	339	548	226	...	192	...	1,305
	12	364	2,008	1,535	713	96	441	87	4,880	788	573	284	16	145	14	1,820	640	700	334	...	187	...	1,861
Total ...	...	2,977	20,183	13,084	5,606	1,140	3,103	878	43,994	5,793	3,957	2,018	194	1,136	132	13,230	4,273	4,892	3,501	...	1,847	81	14,594
XII.—Sunkheri ...	1—10										Not valued.												
XIV.—Balot South...	1	144	1,417	1,168	323	66	130	83	3,187	244	313	177	38	92	31	895	1	...	3	...	3	...	7
	2	136	2,819	2,271	555	42	240	29	5,956	417	566	277	12	130	12	1,414	20	13	14	...	11	..	58
	3	164	3,599	2,909	623	73	198	60	7,462	551	558	186	68	118	55	1,536	2	12	9	...	1	...	24
	4	120	2,417	1,928	400	77	129	80	5,031	227	134	40	11	14	5	431	...	...	1	...	...	...	1
	5	172	2,884	1,316	278	29	76	15	4,598	850	457	161	49	72	38	1,627	...	...	...	...	...	...	...
	6	161	8,163	2,736	287	39	57	18	11,300	977	648	171	51	85	43	1,975	...	...	2	...	1	...	3
	7								Not valued.														
Total ...	...	897	21,299	12,328	2,466	326	830	285	37,534	3,266	2,676	1,012	229	511	184	7,878	23	25	29	...	16	.	93
XVI.—Balot North...	1—5											Not valued.											
	6	197	4,244	1,805	284	30	47	7	6,417	1,465	831	277	24	178	24	2,799	126	157	117	...	204	...	604
	7											Not valued.											
	8	160	915	522	167	14	87	17	1,722	685	532	252	15	155	15	1,654	53	35	23	...	9	...	120
	9	78	1,451	1,133	343	57	90	24	3,098	470	410	174	16	95	13	1,178	62	29	33	...	32	...	156
	10	108	415	396	123	17	51	18	1,020	274	374	172	29	77	17	943	45	15	4	...	...	..	64
	11	118	1,167	426	225	24	89	28	1,959	52	279	232	16	188	16	1,252	28	7	3	...	2	...	40
	12	99	1,072	446	117	20	50	15	1,720	599	242	147	15	132	8	1,143	5	14	2	...	...	...	21
	13	74	173	168	82	6	39	6	474	149	122	80	8	59	6	424	22	46	34	...	21	..	123
	14	126	546	335	170	10	264	13	1,338	335	268	150	14	107	9	883	4	8	...	...	...	...	12
	15	74	147	90	54	1	15	2	309	88	104	95	3	85	5	380	10	19	18	...	14	...	61

	16	87	668	400	165	9	57	8	1,307	261	298	169	5	125	5	863	1	6	...	...	1	...	71
	17	130	1,296	806	295	4	57	12	2,470	781	726	282	9	178	9	1,985	...	...	...	...	1	...	1
	18	102	455	343	141	11	72	3	1,025	145	189	141	19	90	9	593	24	22	13	...	23	...	82
Total ...	...	1,353	12,549	6,870	2,166	203	918	153	22,859	5,773	4,375	2,171	173	1,469	136	4,097	380	358	247	...	306	...	1,291
XVI.—Silani	1	223	982	892	555	142	246	127	2,944	342	382	185	39	120	30	1,098	11	12	10	...	6	...	39
	2	192	1,143	912	436	139	137	70	2,837	308	251	143	26	112	11	851	30	36	30	...	12	...	110
	3	104	913	615	203	66	70	29	1,896	359	224	96	36	47	14	776	39	44	41	...	27	...	151
	4	244	2,088	1,658	778	118	318	115	5,070	652	490	264	48	219	19	1,707	84	109	50	...	10	...	253
	5	147	1,376	1,277	550	104	242	110	3,659	417	442	211	51	165	41	1,327	12	11	6	...	1	...	30
	6	128	586	565	271	94	119	63	1,698	309	252	167	21	111	19	879	65	85	45	...	16	...	211
	7	139	982	1,180	751	129	310	123	3,475	327	225	167	15	98	21	853	12	11	9	...	9	...	41
	8	221	2,272	2,061	629	185	221	94	5,462	1,059	1,135	606	88	376	42	3,306	76	123	56	...	22	...	277
	9	234	1,608	1,545	547	48	215	41	4,004	773	641	406	23	268	11	2,122	154	182	102	...	66	...	504
	10	176	1,292	814	458	143	258	147	3,112	371	277	124	33	93	27	925	350	164	106	...	23	...	643
Total ...	...	1,811	13,242	11,519	5,178	1,168	2,131	919	34,157	4,917	4,319	2,369	375	1,609	255	3,844	833	779	455	...	192	..	2,259
XVIII.—Khonani South.	1	197	1,786	1,584	767	125	239	69	4,570	867	507	233	17	145	14	1,783	188	193	56	...	7	...	444
	2	259	2,686	2,091	682	88	214	59	5,820	1,594	1,045	342	24	184	10	3,199	71	107	58	...	18	...	254
	3	242	2,927	3,015	1,489	442	453	310	8,586	1,268	718	376	41	252	33	2,688	1	...	1	...	2	...	4
	4	156	1,011	1,317	503	103	248	69	3 251	328	314	183	21	104	12	962	66	107	54	...	25	...	252
	5	196	3,310	2,985	891	101	293	105	7,685	691	592	170	10	61	12	1,536	127	124	73	...	54	...	378
	6	204	1,669	1,451	860	192	490	236	4,898	271	227	137	33	99	32	799	120	130	101	...	28	...	379
	7	278	5,453	4,561	1,510	179	533	132	12,368	679	573	251	48	122	44	1,717	78	93	66	...	81	...	268
Total ...	...	1,532	18,842	17,004	6,658	1,230	2,470	980	47,178	5,698	3,976	1,692	194	967	157	12,684	651	754	409	...	165	...	1,979
XIX.—Khonani North,	1	124	1,429	960	335	38	134	24	2,920	744	451	195	32	93	14	1,529	...	...	...	...	1	...	1
	2	137	1,075	655	304	50	171	42	2,297	359	373	229	22	114	10	1,107	25	40	12	...	2	...	79
	3	125	2,472	1,481	488	53	217	51	4,762	986	722	323	31	143	14	2,219	125	139	52	...	9	1	326
	4	218	566	620	246	22	91	19	1,564	346	242	100	23	10	15	786	14	13	13	...	...	...	40
	5	183	1,091	981	489	91	221	83	2,956	589	459	256	38	149	30	1,521	27	39	28	...	11	...	105
	6	174	991	877	386	57	166	56	2,533	609	431	173	26	81	23	1,343	63	63	21	..	6		153
	7	112	464	385	187	9	93	11	1,149	345	247	135	7	72	9	815	26	20	3	...	...	..	49
	8	195	2,207	1,568	637	134	248	93	4,887	480	267	295	28	159	21	1,250	...	3	9	...	1	...	13
	9	243	2,434	1,910	777	62	309	45	5,537	1,162	769	322	42	90	25	2,410	37	63	16	.	..	...	116
Total ...		1,511	12,729	9,437	3,849	516	1,650	424	28,605	5,620	3,961	2,028	249	961	161	12,980	317	380	154	...	30	1	882
XX.—Rata Rau	1	171	1,044	863	408	21	150	40	2,526	292	314	271	23	203	28	1,131	32	17	26	...	35	..	110
	2	114	1,726	1,101	376	23	137	9	3,372	548	367	156	25	109	23	1,228	61	69	44	...	69	...	243
	3	222	4,442	2,577	621	28	169	17	7,854	907	634	188	26	90	23	1,868	70	140	151	...	293	...	654
	4	129	1,333	797	201	20	122	22	2,495	311	295	172	30	33	12	913	253	217	226	..	320	...	1,016
	5	175	1,697	1,009	397	53	158	42	3,356	324	224	93	23	38	17	710	85	114	149	...	203	...	551
Total ...	...	811	10,242	6,347	2,003	145	736	130	19,603	2,379	1,834	880	127	533	103	5,856	501	557	596	...	920	...	2,574

Table of Contents of Compartments—(continued).

Block.	Number of compartments.	Area valued in acres.	SAL.							SAIN.							CHIR.						
			IV. Class.	III. Class.	II. Class.		I. Class.		Total.	IV. Class.	III. Class.	II. Class.		I. Class.		Total.	IV. Class.	III. Class.	II. Class.		I. Class.		Total.
					Sound.	Unsound.	Sound.	Unsound.				Sound.	Unsound.	Sound.	Unsound.				Sound.	Unsound.	Sound.	Unsound.	
XXI.—Bhalsani ...	1	238	4,232	3,010	576	75	168	46	8,107	942	818	261	35	158	19	2,233	57	119	99	...	82	...	357
	2	301	3,905	3,280	959	144	290	119	8,697	495	467	209	103	132	100	1,506	85	97	84	...	102	...	368
	3	186	1,337	980	539	75	256	51	3,238	500	414	266	21	211	18	1,430	12	11	12	...	...	...	35
	4	298	3,494	2,384	874	168	348	89	7,357	1,013	1,060	597	98	380	66	3,214	31	54	27	...	7	...	119
	5	125	834	408	150	71	113	33	1,609	300	417	222	26	122	19	1,106	...	...	...	...	...	...	...
	6	118	1,887	1,028	214	39	68	16	3,252	224	238	114	24	73	24	697	1	1	1	...	2	...	5
Total ...	...	1,266	15,689	11,090	3,312	572	1,243	354	32,260	3,474	3,414	1,669	307	1,076	246	10,186	186	282	223	...	193	...	884
XXII.—Aonla Khera North.	1	145	2,362	1,323	345	65	113	22	4,230	355	342	126	29	95	34	981	20	41	36	...	22	...	119
	2	196	1,482	887	319	39	169	29	2,925	621	570	286	38	220	31	1,766	13	34	33	...	17	...	97
	3	202	3,004	1,429	400	60	190	56	5,139	718	520	199	18	167	17	1,639	3	7	8	...	3	...	21
	4	161	2,477	1,636	532	67	254	67	5,033	807	550	261	47	120	45	1,830	2	4	6	...	10	...	22
	5	245	2,714	1,697	670	84	315	80	5,560	1,039	843	359	41	182	24	2,488	14	29	53	...	10	...	106
	6	207	1,226	969	549	75	278	111	3,208	167	204	124	9	121	12	637	11	23	15	...	8	...	57
	7	240	2,216	1,281	447	167	164	86	4,361	1,069	864	427	52	264	54	2,730	14	31	49	...	24	...	118
	8	295	4,429	3,859	1,439	163	450	115	10,461	672	886	393	138	238	142	2,469	15	14	26	...	25	...	100
Total ...	...	1,691	19,910	13,081	4,701	720	1,939	566	40,917	5,448	4,779	2,175	372	1,407	359	14,540	92	183	226	...	139	...	640
XXIII.—Aonla Khera South.	1	262	2,305	1,729	684	150	315	79	5,262	445	469	183	48	96	33	1,274	106	116	92	...	47	...	361
	2	147	551	739	580	57	371	88	2,386	70	143	108	5	83	12	421	52	39	49	...	20	...	160
	3	215	1,249	1,368	762	93	406	113	3,991	316	312	153	14	132	18	945	21	28	46	...	27	...	122
	4	165	1,437	831	237	78	65	34	2,682	720	592	236	31	83	12	1,674	101	104	60	...	21	...	286
	5	267	1,244	857	338	88	254	90	2,871	318	349	161	25	109	24	986	339	288	218	...	160	1	1,006
	6	235	2,656	2,549	780	104	278	93	6,460	691	778	292	47	153	20	1,981	13	26	11	...	16	...	66
	7	194	2,567	2,332	897	190	328	117	6,431	515	427	207	41	117	30	1,237	75	90	51	...	30	...	246
Total ...	...	1,485	12,009	10,405	4,278	760	2,017	614	30,083	3,075	3,070	1,340	211	773	149	8,618	707	691	527	...	321	1	2,247

XXIV —Gauni Rau ...	1	200	2,151	2,411	861	73	260	35	5,791	586	902	493	37	420	48	2,486	5	12	7	...	3	...	2
	2	86	853	755	282	36	119	18	2.063	389	397	178	13	107	7	1,091	1	4	2	...	...	...	7
	3	243	1,433	1,177	617	95	421	307	4,050	541	427	267	30	201	31	1,497	2	5	...	...	...	...	7
	4	113	912	850	502	45	372	107	2,788	52	85	76	4	101	16	334	...	...	...	...	...	...	..
	5	101	600	858	345	43	223	24	2,093	125	232	145	1	113	2	618	.	7	5	...	...	...	15
	6	133	1,004	666	276	51	182	41	2,220	402	267	113	12	64	8	866	182	141	49	...	11	...	383
	7	196	195	293	198	7	242	19	954	29	96	41	1	16	2	135	40	73	51	...	38	...	202
	8	139	810	580	213	15	109	23	1,750	231	171	71	4	18	2	497	150	167	68	...	18	...	403
	9	74	132	195	147	13	213	32	732	34	25	10	.	11	1	81	122	75	35	...	31	...	263
	10	225	2,981	2,225	598	53	172	24	6,053	637	342	175	6	121	5	1,286	121	115	60	...	16	...	302
	11	164	3,762	2,422	996	48	367	74	7,669	306	152	104	1	127	2	692	33	29	13	...	1	...	76
	12	151	2,248	1,846	647	59	312	47	5,159	403	309	101	11	125	10	959	3	14	8	...	10	...	35
	13	169	1,086	937	570	34	263	37	2,927	457	348	181	11	140	8	1,145	153	117	113	...	66	...	449
Total ...	..	1,994	18,167	15,215	6,252	572	3,255	788	44,249	4,192	3,703	1,955	131	1,564	142	11,687	805	759	411	...	194	...	2,169
XXV.—Chila ...	1	164	1,336	856	341	105	90	43	2,771	439	411	169	38	112	26	1,195	30	34	18	...	9	...	91
	2	229	1,616	1,391	730	87	403	71	4,298	507	527	286	29	173	16	1,538	178	204	122	...	55	...	559
	3	333	1,960	1,400	698	53	360	55	4,526	637	621	329	12	172	2	1,773	150	111	77	...	35	...	373
	4	209	3,975	2,153	468	56	223	48	6,923	483	648	228	24	209	15	1,607	193	331	233	...	191	...	948
	5	206	655	303	161	6	128	20	1,273	314	174	73	...	32	1	594	75	27	61	...	23	...	186
	6	208	2,927	1,844	548	40	211	25	5,595	758	635	237	24	153	6	1,813	194	214	221	...	131	...	760
	7	229	1,870	1,690	863	89	363	118	4,993	337	341	181	7	124	18	1,008	137	160	104	...	43	...	444
	8	204	1,117	866	445	20	319	36	2,803	534	386	170	9	99	2	1,200	206	229	141	...	60	...	636
	9	275	2,572	2,223	824	112	379	62	6,172	762	643	304	26	189	18	1,942	472	484	266	...	193	...	1,415
Total ...	...	2,057	18,028	12,726	5,078	568	2,476	478	39,354	4,771	4,386	1,977	169	1,263	104	12,670	1,635	1,794	1,243	...	740	...	5,412
XXVI.—Kholgarh South.	1	251	2,785	1,793	786	55	371	49	5,839	814	734	305	5	198	8	2,064	117	107	91	...	35	...	350
	2	211	734	621	245	18	197	27	1,842	127	119	34	1	36	1	318	133	210	82	...	31	...	456
	3	250	421	223	142	14	137	24	961	32	15	10	1	14	3	75	12	18	21	...	14	...	65
	4	203	889	479	237	27	137	37	1,806	488	320	176	22	125	17	1,148	411	491	311	...	144	1	1,358
	5	272	1.889	1,009	347	21	171	25	3,462	768	563	290	8	119	3	1,751	534	514	363	...	161	...	1,572
	6	191	1,027	530	249	18	113	25	1,962	459	345	109	5	66	5	989	770	579	350	...	167	..	1,866
	7	225	4,827	3,091	547	101	189	47	8,802	579	776	226	30	131	15	1,757	260	352	223	...	156	...	991
	8	140	569	308	106	23	82	22	1,110	283	201	85	6	48	1	624	246	220	127	...	69	...	662
	9	295	2,795	917	434	80	317	97	4,640	182	77	31	2	60	9	363	443	262	254	...	246	...	1,205
	10	304	1,921	1,531	602	67	347	59	4,527	411	374	211	7	127	5	1,135	385	373	348	...	308	...	1,414
Total	..	2,342	17,857	10,502	3,695	424	2,061	412	34,951	4,143	3,524	1,479	87	924	67	10,224	3,311	3,126	2,170	...	1,331	1	9,939

APPENDIX B.

Table of Contents of Compartments—(continued).

Block.	Number of compartment.	Area valued in acres.	Sál.							Sain.							Chir.						
			IV. Class.	III. Class.	II. Class.		I. Class.		Total.	IV. Class.	III. Class.	II. Class.		I. Class.		Total.	IV. Class.	III. Class.	II. Class.		I. Class.		Total.
					Sound.	Unsound.	Sound.	Unsound.				Sound.	Unsound.	Sound.	Unsound.				Sound.	Unsound.	Sound.	Unsound.	
XXVII.—Kholgarh North.	1	108	1,084	839	336	11	140	5	2,415	353	302	160	3	85	3	906	45	87	26	...	13	...	171
	2	153	1,366	1,331	603	44	372	37	3,753	225	256	178	5	112	2	778	18	25	29	...	19	...	91
	3	234	2,380	1,350	440	40	60	16	4,286	126	108	44	4	36	4	322	8	4	4	...	2	...	18
	4	95	521	493	162	17	65	2	1,260	62	90	31	...	21	2	206	...	3	4	...	...	...	7
	5	88	1,097	807	226	18	129	11	2,288	81	70	24	...	14	1	190	30	32	21	...	16	...	99
	6	233	2,582	1,714	285	67	143	43	4,834	442	293	70	6	67	7	885	7	5	4	...	2	...	18
	7	244	2,964	1,408	383	14	128	21	4,918	385	190	110	...	63	...	748	11	10	11	...	11	...	36
	8	91	2,389	1,395	384	56	107	33	4,364	70	55	26	6	24	1	182	...	...	3	...	2	...	5
	9	140	2,989	1,480	454	35	112	37	5,107	139	82	25	3	24	2	275	...	...	3	...	2	...	5
	10	113	598	423	121	8	49	13	1,212	47	28	9	2	3	2	91	...	...	...	...	...	...	...
	11	88	1,591	446	151	8	80	20	2,296	103	40	7	...	5	...	155	...	2	1	...	1	...	4
	12	152	2,577	1,052	404	48	197	51	4,329	134	33	7	2	16	2	194	...	...	...	...	...	...	...
	13	197	679	314	72	2	43	9	1,119	52	31	14	1	15	2	115	...	...	...	...	...	...	...
	14	132	1,043	580	207	11	110	11	1,962	39	31	11	2	9	3	95	...	...	...	...	...	...	...
	15	110	827	441	161	25	146	30	1,630	79	85	22	1	23	7	217	1	...	1	...	1	...	3
	16	127	682	407	210	21	230	31	1,581	111	70	62	1	113	6	363	1	4	...	...	5	...	10
	17	112	1,066	345	106	9	66	6	1,598	148	115	29	3	23	1	319	...	2	2	...	...	...	4
	18	158	811	441	239	19	243	51	1,804	24	21	10	2	26	5	88	...	...	...	...	...	...	...
	19	137	892	691	287	10	168	6	2,054	102	63	20	...	10	...	195	10	10	7	...	...	...	27
	20	178	3,856	1,507	241	38	113	25	5,780	422	208	36	4	26	2	698	2	5	2	...	...	...	9
Total ...	...	2,890	31,994	17,464	5,472	501	2,701	458	58,590	3,144	2,171	895	45	715	52	7,022	133	189	118	...	67	...	507
XXVIII.—Durga Pipal.	1	184	968	491	474	35	243	32	2,243	188	170	77	5	59	4	503	344	372	312	...	212	...	1,240
	2	221	2,908	1,402	514	112	354	84	5,374	349	260	152	17	141	11	930	485	474	347	...	368	...	1,674
	3	149	531	287	87	41	29	14	989	101	89	26	8	9	5	238	102	126	103	...	65	...	396
	4	238	1,482	1,189	278	74	201	34	3,258	348	247	55	10	18	4	682	623	1,078	494	...	255	...	2,450
	5	142	1,392	725	299	86	149	83	2,734	177	128	61	11	28	6	411	784	555	399	...	193	...	1,931
	6	117	1,386	701	327	14	178	71	2,677	41	10	2	...	...	1	54	99	91	45	...	28	...	263
	7	132	3,397	1,250	445	54	172	50	5,368	139	58	22	...	4	...	223	151	177	91	...	17	...	436
	8	234	6,016	3,957	1,145	224	339	124	11,805	765	223	24	3	6	3	1,024	724	583	266	...	69	...	1,642
	9	188	902	1,285	740	90	460	94	3,571	302	222	143	10	63	9	749	70	76	97	...	43	...	286
	10	234	3,747	2,837	1,230	81	655	86	8,636	342	298	150	13	169	7	979	193	370	89	...	22	...	664
	11	158	4,687	1,556	569	47	228	70	7,157	124	97	54	1	30	2	308	65	31	19	...	6	...	121
Total ...	...	1,997	27,416	15,680	6,108	858	3,008	742	53,812	2,876	1,802	766	78	527	52	6,101	3,640	3,923	2,262	...	1,278	...	11,103

APPENDIX B.

Table of Contents of Compartments—(continued)-

Block.	Number of compartment.	Area valued in acres.	Shisham. IV. Class.	Shisham. III. Class.	Shisham. II. Class. Sound.	Shisham. II. Class. Unsound.	Shisham. I. Class. Sound.	Shisham. I. Class. Unsound.	Shisham. Total.	Khair. IV. Class.	Khair. III. Class.	Khair. II. Class. Sound.	Khair. II. Class. Unsound.	Khair. I. Class. Sound.	Khair. I. Class. Unsound.	Khair. Total.	Number of Sál to the Acre. III. and IV. Class.	Number of Sál to the Acre. I. and II. Class.	Number of Sál to the Acre. Total.	Number of Sain to the Acre. III. and IV. Class.	Number of Sain to the Acre. I. and II. Class.	Number of Sain to the Acre. Total.	Number of Chir to the Acre. III. and IV. Class.	Number of Chir to the Acre. I and II. Class.	Number of Chir to the Acre. Total.	Total of all three species per acre.
I.—Jariâ Khal S. ...	1	295	...	...	...	...	...	...	...	187	35	4	...	...	...	226	4·07	6·11	10·18	·30	·18	·48	. .	...	...	10·56
	2	197	..	...	...	...	...	...	...	24	7	...	...	...	...	31	34·23	8·93	42·16	·20	·16	·66	...	...	...	42·52
	3	240	14	7	...	...	...	...	21	81	24	3	...	...	...	108	40·20	4·46	44·66	·20	1·06	1·06	...	...	...	44·92
	4	194	1	..	1	...	...	...	2	72	20	1	...	...	...	93	39·47	6·37	45·84	·57	·46	·46	·01	...	·01	46·88
	5	174	2	...	...	1	...	...	3	144	13	...	...	...	...	157	40·08	6·97	46·05	·67	·66	·56	...	...	...	47·33
Total	...	...	1,100	17	7	1	1	...	...	26	508	99	8	..	...	...	615	38·95	6·28	45·23	·37	·27	·27	·01	...	·01	45·88
II.—Jaria Khal N....	No. of compartment.	1,215	Has not been valued.																							
III.—Khamari ...	1	268	...	...	...	...	...	...	...	86	45	5	...	...	...	136	70·49	1·31	71·80	1·44	1·06	2·50	...	...	...	74·30
	2	102	...	...	...	...	...	...	...	1	...	...	...	..	...	1	38·82	1·28	40·10	1·08	1·78	2·86	...	...	...	42·96
	3	112	...	...	...	...	...	...	...	3	3	...	...	...	...	6	24·62	2·76	27·38	1·26	1·96	3·22	...	...	...	30·60
	4	73	...	...	...	...	...	...	...	1	1	...	...	...	...	2	9·19	·61	9·80	·61	·76	1·37	...	...	...	11·17
	5	55	...	...	...	...	...	...	...	...	1	1	...	...	...	2	4·67	·78	5·45	·27	·29	·56	...	...	...	6·04
Total	...	...	610	...	..	...	...	...	...	...	91	50	6	...	...	...	147	43·50	1·44	44·94	1·14	1·25	2·39	...	.	...	47·33
IV.—Khapkot ..	1	50	2,186	551	24	...	...	...	2,761	811	257	14	...	...	...	1,082	.	...	..	·30	...	·3	...	...	...	·3
	2	264	23	17	4	...	...	...	44	142	57	4	...	1	...	204	65·79	3·84	69·63	2 85	1·08	3·93	·10	·09	·19	73 75
	3	112	443	105	3	...	...	...	551	1,028	339	50	...	8	...	1,419	22·01	3·02	25·03	7·14	1·81	8·95	·11	·06	·17	33·15
Total	...	...	433	2,652	673	31	...	...	...	3,356	1,981	647	68	...	9	...	2,705	46·16	4 09	50·25	3·75	1·13	4·88	·09	·07	·16	55·29
V.—Bansa ...	1	175	5	2	...	...	2	...	9	1	2	...	..	..	...	3	65·00	1·69	66·69	·16	·38	·54	...	...	...	67·23
	2	241	23	3	...	...	..	...	26	...	...	...	...	..	...	...	89 17	1·98	91·15	·08	.09	·17	...	...	...	91·32
	3	135	202	83	3	...	...	...	292	47	7	...	...	...	...	54	119·93	2·45	122·38	1·00	·54	1·54	...	...	...	123·92
	4	129	...	...	...	...	...	...	...	...	...	...	...	...	...	...	90·37	3·44	93·81	1·82	·203	3·85	...	...	...	97·66
	5	123	211	17	...	...	...	..	228	191	72	3	...	...	.	266	12·71	·80	13·51	2·22	·295	5·17	...	...	...	18·68
Total	...	...	803	445	105	3		2	...	555	239	81	3	...	...	...	323	77·81	2·05	79·85	·86	·98	1·84	...	...	...	81·69
VI.—Naghan ...	1	157	...	2	...	...	...	...	2	208	41	10	...	6	...	265	6 56	·21	6·77	1·04	·16	2·20	...	...	...	8·97
	2	114	...	...	...	...	...	...	...	17	9	...	...	...	...	26	86·89	1·24	88·13	·50	·75	1·25	...	...	...	89·38
	3	97	...	...	...	...	...	...	...	54	30	1	...	...	..	85	21·57	1·09	22·66	·12	·29	·41	...	...	...	28·07
	4	214	...	...	...	...	...	...	...	8	...	...	...	...	...	8	83·49	2·01	85·50	·38	·26	·64	...	...	...	86·14
	5	104	...	...	...	...	...	...	...	5	6	...	...	...	...	11	30·72	2·18	32·39	2·84	2·13	4·97	...	...	...	37·36
Total	...	...	686		2	...	...	...	2	292	86	11	...	6	...	395	49·65	1 37	51·02	·89	·84	1·73	...	...	...	52·75
VII.—Dangaona ..	1	153	...	...	...	...	...	..	...	17	10	2	...	..	...	29	18·18	·17	18·35	...	·01	·01	...	...	...	18·36
	2	158	...	...	...	...	...	...	...	26	20	4	...	1	...	51	43·31	·53	43 84	·08	...	·08	...	...	...	43·92
	3	185	...	...	...	...	...	...	...	29	11	1	...	...	..	41	9·36	·11	9·47	·06	·07	·13	...	...	...	9·60
	4	139	...	2	...	...	...	...	2	26	23	2	...	1	..	52	·11		·11	·19	·14	·33	...	...	...	·44
	5	190	...	...	...	...	...	...	...	41	24	3	...	..	..	68	·66	·10	·76	·18	·42	·60	. .	...	...	1·36
Total	...	...	825	...	2	...	...	..	...	2	139	88	12	...	2	...	241	13·8	·18	14 98	·10	·11	·21	...	...	...	15·19

APPENDIX B.

Table of Contents of Compartments—(continued).

Block.	Number of compartment.	Area valued in acres.	Shisham. IV. Class.	Shisham. III. Class.	Shisham. II. Class. Sound.	Shisham. II. Class. Unsound.	Shisham. I. Class. Sound.	Shisham. I. Class. Unsound.	Shisham. Total.	Khair. IV. Class.	Khair. III. Class.	Khair. II. Class. Sound.	Khair. II. Class. Unsound.	Khair. I. Class. Sound.	Khair. I. Class. Unsound.	Khair. Total.	Number of Sal to the Acre. III. and IV. Class.	Number of Sal to the Acre. I. and II. Class.	Number of Sal to the Acre. Total.	Number of Sain to the Acre. III. and IV. Class.	Number of Sain to the Acre. I. and II. Class.	Number of Sain to the Acre. Total.	Number of Chir to the Acre. III. and IV. Class.	Number of Chir to the Acre. I. and II. Class.	Number of Chir to the Acre. Total.	Total of all three species per acre.
VIII.—Chini ...	1											Not valued.														
	2											Ditto.														
	3											Ditto.														
	4											Ditto.														
	5	186	...	...	...	...	...	...	...	...	...	...	...	...	...	...	17·30	4·28	21·58	1·01	·54	1·52	1·47	1·04	2·51	25·61
	6	174	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15·63	4·59	20 22	11·41	3·66	15·07	·59	·27	·86	36·15
	7	140	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8·17	1·79	9·96	9·47	2·37	11·84	·39	·10	·49	22·29
	8	226	...	...	...	...	...	...	...	1	1	...	...	...	...	2	11·70	1·11	12·81	·67	1·33	2·00	...	...	...	14·81
	9	240	...	...	...	...	...	...	...	...	1	...	...	...	...	1	43·00	2·97	45·97	2·87	1·66	4·53	·02	...	·02	50·52
	10	156	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20·85	20·87	41·72	13·75	1·78	15·53	·39	·08	·47	57·72
	11											Not valued.														
	12	154	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21·74	5·37	27·11	6·11	3·76	9·87	·12	·06	·18	37·16
	13	73	...	...	...	...	...	...	...	...	...	...	...	...	...	...	52·78	6·26	59·04	7·19	2·79	9·98	...	...	...	59·02
	14	108	...	...	...	...	...	...	...	2	3	...	...	...	...	5	12·21	4·38	16·59	·72	2·39	3·11	...	...	...	19·70
	15	444	...	...	...	...	...	...	...	5	8	...	...	...	...	13	94·64	1·11	95·75	·02	·03	·05	...	...	...	95·80
	16	149	...	...	...	...	...	...	...	...	3	...	...	...	...	3	63·31	4·23	67·54	·86	1·03	1·89	...	...	...	69·43
	17	183	...	...	...	...	...	...	...	14	8	1	...	1	...	24	61·40	4·57	65·97	1·93	1·10	3·09	...	...	...	69·06
	18	137	...	...	...	...	...	...	...	5	3	1	...	1	...	10	37·73	4·97	42·70	5·22	2·91	8·13	·06	...	·06	50·89
	19	171	...	...	...	...	...	...	...	...	...	...	...	...	...	...	25·28	2·94	28·22	13·61	3·50	17·11	...	...	...	45·33
	20											Not valued.														
	21	148	...	...	...	...	...	...	...	...	...	...	...	...	...	...	24·32	4·15	28·47	13·39	2·75	16·14	·49	·12	·61	45·22
	22	175	...	...	...	...	...	...	...	12	14	1	...	...	...	27	39·20	2·97	42·17	8·66	2·01	10·67	·17	·21	·38	53·22
	23	135	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21·74	5·08	26·82	5·86	3·70	9·56	...	·01	·01	35·39
	24	131	...	...	...	...	...	...	...	...	...	...	...	...	...	...	29·34	4·16	33·50	4·49	2·26	6·75	...	...	...	40·25
	25	96	...	...	...	...	...	...	...	...	1	...	...	...	...	1	29·21	3·41	32·62	4·47	2·18	6·65	...	...	...	39·27
	26	95	...	...	...	...	...	...	...	...	...	...	...	...	...	...	61·15	9·02	70 17	13·07	1·81	14·83	...	...	...	85·05
	27	96	...	...	...	...	...	...	...	...	...	...	...	...	...	...	27·98	6·12	34·10	4·84	1·18	6·02	·03	...	·03	40·15
	28	82	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21·67	5·40	27·07	1·68	2·24	3·92	·09	·04	·13	31·12
	29	182	...	...	...	...	...	...	...	18	7	...	...	...	...	25	50 09	3·79	53 88	·32	·38	·70	...	...	...	54·58
	30	236	...	...	...	...	...	...	...	14	3	2	...	...	...	19	66·24	4·85	71 09	1·16	1·00	2·16	...	...	...	73·25
	31	125	...	...	...	...	...	...	...	...	...	...	...	...	...	...	68·03	5·04	73·07	·32	·66	·98	...	...	...	74·05
	32	153	...	...	...	...	...	...	...	2	...	...	...	...	...	2	111·22	2·07	113·29	·20	·04	·24	...	...	...	113·53
	33	169	...	...	...	...	...	...	...	3	1	1	...	...	...	5	106·55	3·18	109·73	·24	·07	·31	...	...	...	110·04
	34	131	2	...	...	...	...	...	2	16	8	...	...	...	...	24	72·74	3·57	76·3	·14	·12	·26	...	...	...	76·57
	35	127	21	8	3	...	...	...	32	16	3	1	...	...	...	20	31·16	3·94	35 10	3·12	2·28	5·50	...	...	...	40·60
	36	150	...	...	...	...	...	...	...	4	...	1	...	...	...	5	48·44	3·79	52·23	10·56	2·84	13·40	...	...	...	65·63
	37	149	...	...	...	...	...	...	...	...	...	...	...	...	...	...	38·19	4·53	42·72	8·04	2·50	10·54	...	...	...	53·26
	38											Not valued.														
	39											Ditto.														
	40											Ditto.														

	41	107	...	...	...	...	...	...	...	...	...	...	...	...	...	...	39·13	5·91	45·04	5·17	3·33	8·50	...	...	...	53·54
	42	114	...	...	...	...	...	...	...	...	...	...	...	...	...	...	50·71	4·81	55·52	3·21	2·23	5·44	...	...	...	60·96
	43	153	7	1	...	...	...	...	8	8	..	...	...	...	...	8	55·09	3·58	58·77	·71	·77	1·48	...	...	...	60·25
	44	94	...	...	...	...	...	...	...	...	...	...	...	...	...	...	61·65	4·78	66·43	1·04	1·47	2·51	...	...	...	68·94
	45	103	1	...	...	...	1	...	2	...	...	...	...	...	...	...	84·34	4·84	89·18	6·40	3·12	9·52	...	...	...	98·70
	46	88	...	...	...	...	...	...	...	...	...	...	...	...	...	...	48·51	4·32	52·83	·02	2·62	2·64	...	...	...	55·47
	47	103	...	...	...	...	...	...	...	...	...	...	...	...	...	...	63·31	5·49	68·80	1·20	1·08	2·28	...	...	...	71·08
	48	117	...	...	...	...	...	...	...	1	...	...	...	...	...	1	51·41	1·33	52·74	...	...	...	...	...	...	52·74
	49	93	...	...	...	...	...	...	...	...	..	...	...	...	...	...	87·53	3·07	90·60	1·45	·90	2·35	...	...	...	92·95
	50	104	...	...	...	...	...	...	..	...	...	...	...	...	...	...	25·18	4·18	29·36	6·82	·72	7·54	...	...	...	36·90
	51	119	...	...	...	...	...	...	...	...	...	...	...	...	...	...	91·06	2·95	94·01	1·51	·06	1·57	...	...	...	95·58
	52	112	...	...	..	...	...	...	...	...	...	...	...	...	...	...	11·92	2·50	13·42	·08	·08	·16	...	...	...	13·58
Total ...	...	6,227	31	9	3	...	1	...	44	121	64	8	...	2	...	195	41·92	3·05	44·97	3·34	1·28	4·62	·08	·04	·12	49·71
	1	161	...	...	...	...	...	...	...	6	6	...	...	...	...	12	69·67	1·28	70·95	·36	1·05	1·41	...	...	...	72·35
	2	129	...	..	...	...	...	...	...	3	...	...	...	...	...	3	45·27	2·90	47·23	·22	·02	·24	...	...	...	47·47
	3	129	...	.	1	...	...	...	1	...	2	...	...	...	...	2	57·31	2·82	60·13	·01	...	·01	...	...	...	60·14
	4	131	5	...	...	...	...	...	5	8	4	...	...	...	...	12	96·95	2·64	99·59	2·04	1·74	3·78	...	...	...	103·37
	5	206	10	1	...	...	1	...	12	583	96	8	..	...	...	687	38·10	·47	38·57	2·36	·66	3·02	...	...	...	41·59
	6	210	268	72	5	...	...	...	345	586	150	11	...	...	...	747	49·71	1·80	51·51	6·23	1·55	7·78	...	...	...	59·29
	7	161	...	..	...	...	...	...	...	132	21	4	...	...	...	157	63·68	1·26	64·94	7·97	1·86	9·83	...	...	...	74·77
	8	219	...	...	...	...	...	...	...	285	40	2	...	...	...	327	23·12	2·91	26·03	7·51	2·74	10·25	...	...	...	36·28
	9											Not valued.															
	10	148	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6·85	3·71	10·56	2·92	2·31	5·31	...	...	...	15·79
X.—Kalaunia E...	11	244	...	...	...	...	...	...	...	...	...	..	..	...	..	...	21·98	6·36	28·34	5·78	3·32	9·10	...	...	...	37·44
	12	174	...	...	...	...	...	...	...	4	1	.	...	...	..	5	42·40	6·01	48·41	6·66	2·94	9·60	·05	·09	·14	58·15
	13	166	...	...	...	...	...	...	...	...	...	...	.	...	...	...	31·80	2·76	34·56	5·66	2·52	8·18	·95	2·11	3·06	45·80
	14	195	...	...	...	...	...	...	...	...	...	...	...	...	...	...	58·87	3·07	61·94	9·12	1·26	10·38	1·66	1·63	3·29	75·61
	15	130	...	...	...	...	...	...	...	...	...	...	..	...	...	...	50·56	2·67	53·23	·96	·13	1·09	2·33	2·56	4·89	59·21
	16	144	...	...	...	...	...	...	...	...	...	...	...	...	...	...	38·25	1·31	39 56	14·26	1·07	15·33	·86	4·12	4·98	59·87
	17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	18	74	...	...	...	...	...	...	...	296	17	...	...	...	...	313	16·55	2·64	19·19	12·40	3·12	15·52	...	·01	·01	34·72
	19	136	13	13	...	...	...	...	26	98	7	...	...	...	...	105	36·00	2 87	38·87	5·80	1·07	6·87	...	...	...	45·74
	20	139	4	4	...	...	...	...	...	70	7	...	...	...	...	77	31·84	2·55	34·39	4·82	2·31	7·13	·02	·08	·10	41·62
	21	127	61	...	1	...	...	...	62	1	...	..	...	...	...	1	22·03	2·76	24·79	4·81	1·89	6·70	·50	·40	·90	32·39
	22	98	...	...	1	...	...	...	1	29	1	...	...	...	...	30	27·72	2·85	30·57	10·44	2·56	13·00	·34	1·43	1·77	45·34
Total ...	...	3,121	361	90	8	...	1	..	460	2,101	352	25	...	...	...	2,478	36·19	2·68	38·87	4·95	1·58	6·53	·30	·53	·83	46·23
	1											Not valued.															
	2	159	184	75	25	5	6	2	297	150	10	..	...	...	...	160	21·03	3·52	24·55	2·63	1·33	3·96	·05	·15	·20	28·23
	3	166	125	...	...	...	...	...	125	527	12	...	..	...	...	539	14 19	1·74	15·93	7·77	1·45	9·22	...	·07	·07	25·22
	4	152	1	...	...	...	...	...	1	49	2	...	...	...	...	51	8·23	2·90	11·13	4·36	1·89	6·25	...	·13	·13	17·51
	5	115	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14·32	2·92	17·24	5·91	1·37	7·28	·39	·29	·68	25·20
	6	151	...	...	...	...	...	...	...	1	1	...	...	...	...	2	14·98	3·03	18·01	5·04	1·02	6·06	2·06	1·44	3·50	27·57
	7	108	...	...	...	...	...	...	...	9	3	1	...	1	...	14	38·38	5·42	43·80	8·38	1·48	9·86	·29	·79	1·08	54·74
X.—Kalaunia ...	8	156	...	...	...	...	...	...	...	...	...	..	..	...	...	...	36·67	7·80	44·47	4·68	1·67	6·31	·20	·25	·45	51·23
	9	292	..	...	...	...	...	...	...	1	4	...	...	..	...	5	13·36	3·96	17·32	3·77	2·27	6·04	·28	93	1·21	54·57
	10	146	...	...	...	...	...	...	...	...	...	...	...	...	...	...	26·91	7·00	33·91	8·32	3·45	11·77	·44	·93	1·37	47·05
	11											Not valued.															
	12											Ditto.															
	13	35	44	24	14	...	1	...	83	542	211	15	...	2	..	770	6·14	·25	6·39	3·45	1·45	4·90	...	...	...	11·29
	14											Not valued.															
	15	94	...	...	...	...	...	...	...	9	2	...	...	...	..	11	11·31	2·20	13·51	15·85	2·72	18 57	·06	·03	·09	32·17
Total ...	...	1,574	354	99	39	5	7	2	506	1,288	245	16	..	3	..	1,552	13·11	2·66	15·77	3·73	1·29	5·02	·25	·34	·59	21·38

APPENDIX B.

Table of Contents of Compartments—(continued).

Block.	Number of compartment.	Area valued in acres.	Shisham. IV. Class.	Shisham. III. Class.	Shisham. II. Class. Sound.	Shisham. II. Class. Unsound.	Shisham. I. Class. Sound.	Shisham. I. Class. Unsound.	Shisham. Total.	Khair. IV. Class.	Khair. III. Class.	Khair. II. Class. Sound.	Khair. II. Class. Unsound.	Khair. I. Class. Sound.	Khair. I. Class. Unsound.	Khair. Total.	Number of Sal to the Acre. III. and IV. Class.	Number of Sal to the Acre. I. and II. Class.	Number of Sal to the Acre. Total.	Number of Sain to the Acre. III. and IV. Class.	Number of Sain to the Acre. I. and II. Class.	Number of Sain to the Acre. Total.	Number of Chir to the Acre. III. and IV. Class.	Number of Chir to the Acre. I. and II. Class.	Number of Chir to the Acre. Total.	Total of all three species per acre.
XI.—Dula Gad ...	1	199	67	3	...	...	...	...	70	377	42	4	1	1	...	425	101·46	2·00	103·46	1·33	·37	1·70	...	...	...	105·16
	2	158	...	...	...	...	...	...	...	1	...	...	...	...	...	1	38·72	2·21	40·93	9·41	2·68	12·09	·19	·76	·95	53·97
	3	92	...	...	...	...	...	...	...	...	...	...	...	...	...	...	32·31	3·00	35·37	9·53	2·68	13·21	·50	·52	1·02	48·60
	4	117	...	...	...	...	...	...	...	...	...	...	...	...	...	...	41·12	4·33	45·45	4·68	4·76	9·44	...	...	...	54·89
	5	137	...	...	...	...	...	...	...	2	1	...	...	...	...	3	77·30	4·42	81·45	1·15	1·16	2·31	...	...	...	83·70
	6	447	52	37	1	...	...	...	90	435	172	8	...	2	...	617	30·74	2·19	32·93	·07	...	·07	...	...	...	33·00
	7	276	...	...	...	...	...	...	...	...	...	...	...	...	...	...	66·28	4·17	70·45	·25	·01	·26	...	...	...	70·71
	8	157	...	...	...	...	...	...	...	...	...	...	...	...	...	...	53·14	4·17	57·31	1·58	1·22	2·80	...	...	...	60·11
	9	138	...	...	...	...	...	...	...	...	1	...	...	...	...	1	52·34	4·28	56·62	7·00	2·59	9·59	...	...	...	66·21
	10	143	...	...	...	...	...	...	...	...	...	...	...	...	...	...	33·02	4·63	37·65	6·00	1·74	7·74	...	...	...	45·39
	11	113	...	...	...	...	...	...	...	...	...	...	...	...	...	...	42·91	5·49	48·40	1·61	·91	2·52	...	...	...	50·92
	12	129	...	...	...	...	...	...	...	...	...	...	...	...	...	...	62·06	3·51	65·57	1·57	·93	2·50	...	...	...	68 07
	13	72	...	...	...	...	...	...	...	...	...	...	...	...	...	...	49·73	2·27	52·00	·44	1·11	1·55	...	...	...	53·56
	14	146	...	...	...	...	...	1	1	34	2	...	...	...	...	36	65·94	1·27	67·21	2·67	·15	2·82	...	...	...	70·03
	15									Not valued.																
	16	215	...	...	...	...	...	...	...	...	...	...	...	...	...	...	57·21	2·24	59·45	·25	·17	·42	...	...	...	59·87
	17	76	4	...	...	...	...	...	4	4	2	...	...	...	...	6	99·96	7·33	107·29	7·00	3·80	10·80	...	...	...	118·09
	18	163	6	...	...	...	...	...	6	8	1	...	...	...	...	9	17·89	1·45	19·34	11·43	3·00	14·43	·01	·36	·37	34·14
	19	114	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20·62	4·39	25·01	13·51	2·72	16·23	·90	·12	1·02	42·26
	20									Not valued.																
	21	188	63	7	...	...	...	...	70	57	14	2	...	1	...	74	29·70	4·44	34·14	10·46	3·00	13·46	·03	·01	·04	47·64
	22	161	...	...	...	...	...	...	...	...	...	...	...	...	...	...	27·83	4·44	32·27	6·10	3·70	9·80	...	...	...	42·09
	23	130	...	...	...	...	...	...	...	...	...	...	...	...	...	...	51·94	3·50	55·44	2·88	1·49	4·37	...	...	...	59·81
	24	125	214	43	4	...	...	...	261	23	3	...	...	...	...	26	66·61	0·86	67·47	·48	·04	·52	...	...	...	67·99
	25	108	...	3	1	...	...	...	4	22	7	1	...	...	...	30	83·42	1·40	84·82	·66	·04	·70	...	...	...	185·52
	26	98	...	...	...	...	...	...	...	...	...	...	...	...	...	...	99·24	3·46	102·45	·69	·15	·84	...	...	...	08·29
	27	93	...	...	...	...	...	...	...	...	...	...	...	...	...	...	47·13	2·46	49·59	2·94	2·14	5 08	...	...	...	54·67
	28	115	...	...	...	...	...	...	...	...	...	...	...	...	...	...	41·84	3·86	49·70	8·28	3·40	11·68	...	...	...	61·38
	29	122	...	...	...	...	...	...	...	...	...	...	...	...	...	...	19·65	2·77	3·19	9·39	3·19	12·48	...	...	...	34·84
	30	136	...	...	...	...	...	...	...	21	6	2	...	...	...	29	32·84	2·62	35·46	4·56	2 06	6 62	...	...	...	42·08
	31	129	...	...	...	...	...	...	...	...	...	...	...	...	...	...	25·57	1·04	26·61	2·57	2·93	5·50	...	...	...	32·11
	32	122	...	...	...	...	...	...	...	...	...	...	...	...	...	...	36·68	2·29	38·97	3·08	2·15	5·23	...	...	...	44·20
	33	114	...	...	...	...	...	...	...	...	...	...	...	...	...	...	78·08	1·96	80·04	·89	·31	1·20	...	...	...	81·24
	34	121	223	29	7	...	...	...	259	...	...	...	...	...	...	...	103·56	1·82	105·38	·05	·14	·19	...	...	...	105·57
	35	179	373	11	3	...	...	...	387	...	...	...	...	...	...	...	112·19	1·58	113·57	·98	·03	·11	...	...	...	113·68
	36	116	...	...	...	...	...	...	...	37	2	...	...	...	...	39	55·93	1·56	57·49	·84	·10	·94	..	...	...	58 48
Total ...	...	4,949	1,002	133	16	...	...	1	1,152	1,021	253	17	1	4	...	1,296	53·43	2·97	56·40	3·34	1·32	4·66	·07	·03	·10	61·11

Sarra N.	...	1	168	...	1	...	...	...	1	...	1	...	...	...	...	...	...	39 39	6·42	45·81	5·93	·16	6·09	8·57	·87	9·44	61·34
		2	226	10	9	1	...	1	...		21	210	1	...	...	...	...	211	39·23	7·85	47·08	5·85	·61	6·46	2·46	·84	3·30	56·84
		3	234	2	...	...	...	...	...		2	4	...	..	...	...	...	4	48·85	8·35	57·20	3·71	·80	4·51	·82	·43	1·25	62·96
		4	143	20	10	9	1	...	...		40	283	36	1	...	...	...	320	39·88	6·46	46·34	3·86	1·11	4·97	1.75	·30	2·05	53·36
		5	197	2	6	2	...	...	...		10	113	11	...	...	...	...	124	40·41	6·02	46·43	1·85	·82	2·67	1·01	·17	1·18	50·28
		6	126	...	2	...	..	...	...		2	92	5	...	...	...	...	97	46·49	6·32	52·81	2·27	1·73	4 00	·47	·12	·59	57·40
		7	146	...	...	...	...	...	..		...	14	...	...	...	...	...	14	38·00	5·02	43·02	1·39	1·05	2·44	·07	·04	·11	45·57
		8	140	21	..	...	...	...	...		21	200	11	...	...	...	...	211	64·88	6·63	71·51	1·00	·42	1·42	·03	...	·03	72·96
		9	205	1	...	...	...	...	...		1	33	3	...	...	...	...	36	35·00	5·27	40·27	2·03	1·15	3·18	·13	·01	·14	43·59
		10	190	...	...	...	...	...	..		...	...	...	...	...	...	...	...										
		11	184	14	12	7	1	2	..		36	293	34	...	...	...	...	327	20·04	2·91	22·95	1·37	1·01	2·38	...	·03	·03	25·36
		12	147	1	2	1	...	...	..		4	225	3	...	...	...	...	228	29·25	5·17	34·42	1·36	1·06	2·42	...	...	...	36·84
		13	212	38	8	9	...	...	...		55	369	17	...	...	...	...	386	13·90	2·42	16·32	1·31	1·04	2·35	·04	...	·04	18·71
		14	246	25	7	...	...	...	..		32	238	14	...	...	...	...	252	12·67	5·21	17·88	·72	·68	1·40	...	...	. .	19·28
		15	266	2	2	...	...	...	...		4	157	8	...	...	...	...	165	11·13	1·23	12·36	·70	·78	1·48	·01	·02	·03	13·87
		16	221	...	4	1	...	1	1		7	73	6	...	...	...	...	79	57·85	4·20	62·05	2·84	1·00	3·84	·04	·02	·06	65·95
		17	57	1	1	1	...	...	...		3	103	7	...	...	...	...	110	12·65	3·54	16·19	5·26	1·26	6·52	...	...	...	32·78
		18	87	4	...	...	...	...	...		4	45	1	...	...	...	...	46	18·20	4·23	22·43	2·18	1·78	3·96	...	...	...	26·39
		19	122	4	...	...	...	...	...		4	46	...	...	...	...	...	46	24·67	6·18	30·85	5·37	1·57	6·94	·14	...	·14	37·93
		20	97	2	3	1	...	...	...		6	94	9	...	...	...	...	103	35·09	7·12	42·21	4·12	1·81	5·93	·12	...	·12	48·26
		21	226	63	10	13	...	4	1		91	472	49	...	...	...	...	521	35·31	5·78	41·09	2·83	1·20	4·03	·08	·03	·11	45·23
		22	...	} ...																								
		23	...												Not valued.												
		24	267	47	25	6	...	...	...		78	309	25	...	...	...	...	334	30·18	1·71	31·89	6·13	1·95	8·08	·12	·08	·20	40·17
		25	222	21	4	...	...	...	...		25	512	35	1	...	...	...	548	28·26	2·05	30·31	3·94	1·34	5·28	·01	...	·01	35·60
Total	...	...		4,129	278	106	51	2	8	2	447	3,885	275	2	...	...	...	4,162	32·93	4·86	37·79	2·89	1·07	3·96	·69	·14	·83	42·58
Sarra S.	...	1	216	11	3	2	...	...	...		16	14	1	...	...	...	...	15	9·44	2·03	11·47	3·01	·47	3·48	7·03	3·69	10·72	25·67
		2	187	...	2	3	...	...	1		6	78	3	...	1	...	...	82	10·24	4·16	14·40	3·40	·94	4·34	3·92	3·10	7·02	25·76
		3	274	10	6	2	...	...	...		18	348	26	...	...	...	...	374	10·18	5·02	15·20	3·07	1·00	4·07	4·24	2·84	7·08	26·35
		4	280	27	7	1	..	1	...		36	593	25	1	...	...	...	619	10·35	2·67	13·02	1·88	·64	2·52	1·62	·80	2·42	17·96
		5	140	...	...	...	...	...	...		...	11	3	...	...	...	...	14	7·37	1·58	8·95	3·65	1·44	5·09	3·72	2·82	6·54	20·58
		6	289	43	7	3	1	...	2		56	113	7	1	1	...	...	122	13·17	2·91	16·18	2·92	1·14	4·06	1·49	1·53	3·02	23·16
		7	208	15	17	8	1	4	2		47	429	4	...	...	...	...	433	14·65	3·88	18·53	4·00	1·31	5·31	2·56	1·81	4·37	28·21
		8	175	94	25	1	...	...	...		120	302	3	...	...	...	...	305	12·66	4·10	16·76	2·68	1·01	3·69	2·38	1·21	3·59	24·04
		9	226	...	1	...	...	...	...		1	125	3	...	...	...	...	128	12·82	4·14	16·96	3·80	1·68	5·48	2·11	1·15	3·26	25·70
		10	335	18	17	23	...	3	...		61	1,278	71	1	1	...	...	1,351	13·38	5·01	18·39	3·19	1·66	4·95	2·04	1·25	3·29	26·53
		11	283	85	47	16	...	1	...		149	392	21	...	...	...	...	413	9·16	2·95	12·11	4·06	1·32	5·38	3·13	1·47	4·60	22·09
		12	364	309	203	41	1	5	2		561	1,550	149	...	...	...	...	1,699	9·73	3·67	13·40	3·73	1·26	4·99	3·68	1·43	5·11	23·50
Total	...	...		2,977	612	335	100	3	14	7	1,071	5,233	316	3	3	...	...	5,555	11·17	3·60	14·77	3·27	1·19	4·46	3·07	1·82	4·89	24·12
Sankheri	...	1—10		...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Balot S.	...	1	144	...	...	...	...	...	...		...	...	...	...	...	...	...	...	17·95	4·18	22·13	3·87	2·34	6·21	...	·04	·04	28·38
		2	136	...	...	...	...	...	...		...	...	...	...	...	...	...	...	37·42	6·36	43·78	7·22	3·16	10·38	·24	·18	·42	54·58
		3	164	...	...	...	...	...	...		...	...	...	...	...	...	...	...	39·68	5·81	45·49	6 76	2·60	9·36	·08	·06	·14	54·99
		4	120	...	...	...	...	...	...		...	...	...	...	...	...	...	...	36·20	5·71	41·91	3·00	·58	3·58	...	...	...	45·49
		5	172	...	...	...	...	...	...		...	...	...	...	...	...	...	...	24·41	2·31	26·72	7·59	1·86	9·45	...	...	...	36·17
		6	161	...	...	...	...	...	...		...	...	...	...	...	...	...	...	67·69	2·49	7 18	10·93	2·79	13 72	...	·01	·01	83·91
		7	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	...	...		897	...	...	...	...	...	...	...	...	...	...	...	...	...	...	37·48	4·35	41·83	6·62	2·15	8·77	·05	·05	·10	50·70

APPENDIX B.

Table of Contents of Compartments—(continued).

Block.	Number of compartments.	Area valued in acres.	Shisham, IV. Class.	Shisham, III. Class.	Shisham, II. Class. Sound.	Shisham, II. Class. Unsound.	Shisham, I. Class. Sound.	Shisham, I. Class. Unsound.	Shisham, Total.	Khair, IV Class.	Khair, III. Class.	Khair, II. Class. Sound.	Khair, II. Class. Unsound.	Khair, I. Class. Sound.	Khair, I. Class. Unsound.	Khair, Total.	Number of Sál to the Acre. III. and IV. Class.	Number of Sál to the Acre. I. and II. Class.	Number of Sál to the Acre. Total.	Number of Sain to the Acre. III. and IV. Class.	Number of Sain to the Acre. I. and II. Class.	Number of Sain to the Acre. Total.	Number of Chir to the Acre. III. and IV. Class.	Number of Chir to the Acre. I. and II. Class.	Number of Chir to the Acre. Total.	Total of all three species per acre.
Balot N.	1—5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	6	197	...	...	...	...	...	...	...	...	...	...	...	...	...	...	30·70	1·86	32·56	11·65	2·55	14·20	·143	1·62	3·05	49·81
	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	..	...	...	..	...	..	..	...
	8	160	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8·98	1·78	10·76	7·60	2·73	10·33	·55	·20	·75	21·84
	9	78	...	...	...	..	...	...	...	...	...	...	...	...	...	...	33·12	6·59	39·71	11·28	3·82	15·10	1·16	·41	1·57	56·38
	10	108	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7·51	1·93	9·44	6·00	2·73	8·73	·55	·03	·58	18·75
	11	118	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13·50	3·10	16·60	6·78	3·83	10·61	·29	·04	·33	27·54
	12	99	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15·33	2·04	17·37	8·50	3·05	11·55	·19	·02	·21	29·13
	13	74	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4·61	1·80	6·41	3·66	2·06	5·72	·92	·74	1·66	13·79
	14	126	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7·00	3·62	10·62	4·79	2·30	7·09	·10	...	·10	17·81
	15	74	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3·20	1·00	4·20	2·59	2·54	5·13	·39	·43	·82	10·15
	16	87	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12·27	2·74	15·01	6·42	3·49	9·91	·08	...	·08	25·00
	17	130	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16·17	2·83	19·00	11·59	8·67	15·26	...	...	...	34·26
	18	102	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7·82	2·22	10·04	3·27	2·54	5·81	·45	·35	·80	16·65
Total	...	1,353	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14·35	2·54	16·89	7·50	2·91	10·41	·54	·41	·95	28·25
Silani	1	223	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8·40	4·80	13·20	3·24	1·67	4·91	·10	·02	·12	18·23
	2	192	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10·70	4·07	14·77	2·91	1·52	4·43	·35	·21	·56	19·76
	3	104	...	...		...	...	...	...	...	...	...	...	...	...	...	14·69	3·53	18·20	5·69	1·85	7·45	·80	·65	1·45	27·12
	4	244	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15·35	5·42	20·77	4·68	2·31	6·99	·79	·24	1·03	28·79
	5	147	...	...	...	...	...	...	...	...	...	...	...	...	...	...	18·04	6·84	24·88	5·84	3·18	9·02	·15	·04	·19	34·09
	6	128	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9·00	4·27	13·27	5·16	2·48	7·64	1·17	·47	1·64	22·55
	7	139	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15·55	9·44	24·99	3·97	2·16	6·13	·16	·13	·29	31·41
	8	224	...	...	...	...	...	...	...	...	...	...	...	...	...	...	19·34	5·04	24·38	9·79	4·96	14·75	·88	·34	1·22	40·35
	9	234	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13·47	3·63	17·10	6·04	3·02	9·06	1·43	·71	2·14	28·30
	10	176	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11·96	5·71	17·67	3·68	1·57	6·25	2·92	·73	3·65	26·57
Total	...	1,811	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13·67	5·18	18·85	5·10	2·54	7·64	·89	·35	1·24	27·73

APPENDIX B.

Table of Contents of Compartments.

Block.	Number of compartments.	Area valued in acres.	Number of Sál to the Acre.			Number of Sain to the Acre.			Number of Chir to the Acre.			Total of all three species per acre.
			III. and IV. Class.	I. and II. Class.	Total.	III. and IV. Class.	I. and II. Class.	Total.	III. and IV. Class.	I. and II. Class.	Total.	
XVIII.—Khonani S. ...	1	197	17·10	6·09	23·19	6·97	2·07	9·04	1·93	·32	2·25	34·48
	2	259	18·44	4·02	22·46	10·19	2·16	12·35	·69	·29	·98	25·79
	3	242	24·55	10·92	35·47	8·20	2·90	11·10	...	·01	·01	46·58
	4	156	14·92	5·91	20·83	4·11	2·05	6·16	1·11	·50	1·61	28·60
	5	196	32·11	7·04	39·15	6·54	1·29	7 83	1·28	·63	1·91	48·89
	6	204	15·29	8·71	24·00	2·44	1 47	3·91	1·22	·63	1·85	29·76
	7	278	36·02	8·46	44·48	4·50	1·67	6·17	·61	·35	·96	51·61
Total ...	...	1,532	23·39	7·39	30·78	6·31	1·96	8·27	·92	·37	1·29	40.34
XIX.—Khonani W. ...	1	124	19·26	4·29	23·55	9·63	2·69	12·32	...	...	...	35·87
	2	137	12·62	4·13	16·75	5·34	2·73	7 07	·47	·10	·57	24·39
	3	125	31·62	6·47	37·09	5·66	4·08	9·74	2·11	·49	2·60	49·43
	4	218	5·44	1·73	7·17	2·69	0·98	3·67	·12	·06	·18	11·02
	5	183	11·32	4·83	16·15	5·72	2·55	8·27	·36	·21	·57	24·99
	6	174	10·73	3·82	14·55	5.97	1·74	7·71	·72	·15	·87	23·13
	7	112	7·58	2·67	10·25	5·28	1·99	7·27	·41	·02	·43	17·95
	8	195	19·35	4·6	24·02	3·83	2·57	6·40	·81	·51	·52	30·94
	9	243	17·88	4·90	22·78	7·94	1·97	9·91	·41	·11	·52	33·21
Total ...	...	1,511	14·66	6·26	20·92	6·34	2·24	8·58	·46	·12	·58	31·08
XX.—Rata Rau ...	1	171	11·12	3·61	14·73	3·54	3·07	6·61	·28	·35	·63	21·97
	2	114	24·79	4·78	29·57	8·02	2·74	10·76	·96	·99	1·95	42·28
	3	222	31·61	3·76	35·37	6·94	1·47	8·41	·94	2·00	2·94	46·72
	4	129	16·51	2·82	19·33	4·38	2·37	6·75	3·64	4·23	7·87	33·95
	5	175	15·46	3·71	19·17	3·11	·97	4·08	1·13	2·01	1·14	25·39
Total ...	...	811	20·45	3·71	24·16	5·19	2·02	7·21	1·27	1·86	3·13	34·50
XXI.—Bhalsani ...	1	238	30·42	3·67	34·09	7·39	1·98	9·37	·73	·76	1·49	45·95
	2	301	23·87	5·02	28·89	3·12	1·89	5·01	·60	·61	1·21	35·11
	3	186	12·72	4·95	17·67	4·91	2·77	7·68	·12	·06	·18	25·53
	4	298	19·72	4·96	24·68	7·96	3·82	11·78	·28	·11	·39	36·85
	5	125	9·93	2·93	12·86	5·73	3·11	8·84	...	...	...	21·70
	6	118	24·70	2·85	27·55	3·91	1·90	5·90	·01	·02	·03	33·48
Total ...	...	1,266	21·15	4·23	25·38	5·44	2·60	8·04	·36	·32	·68	34·10
XXII.—Aonla Khera N....	1	145	25·41	3·75	29·16	4·80	1·93	6·73	·42	·40	·82	36·71
	2	196	12·08	2·83	14·91	6·07	1·93	8·00	·23	·25	·48	23·39
	3	202	21·94	3·49	25·43	6·12	1·98	8·10	·04	·05	·09	33·62
	4	161	25·54	5·71	31·25	8·42	2·93	11·35	·03	·09	·12	42·72
	5	245	18·00	4·69	22·69	7·68	2·47	10·15	·17	·25	·42	33·26
	6	207	10·60	4·89	15 49	1·79	1·28	3·07	·18	·11	·29	18·85
	7	240	14·57	3·60	18·17	8·05	3·32	11·37	·18	·30	·48	30·02
	8	295	28·09	7·36	35·45	5·28	3·08	8·36	·09	·24	·33	44·14
Total ...	...	1,691	19 50	4·68	24·18	6·04	2·56	8·60	·16	·21	·37	33·15
XXIII.—Aonla Khera S....	1	262	15·39	4·68	20·07	3·48	1·37	4·85	·84	·53	1·37	26·29
	2	147	8·77	7·45	16·22	1·44	1·41	2·85	·61	·46	1·07	20·14
	3	215	12·17	6·39	18·56	2·92	1·47	4·39	·22	·33	·55	23·40
	4	165	13·64	2·50	16·14	7·95	2·19	10·14	1·24	·49	1·73	28·01
	5	267	7·98	2·88	10·86	2·49	1·19	3·68	2·34	1·42	3·76	18·30
	6	235	22·14	5·34	27·48	6·25	2·17	8·42	·16	·11	·27	36·17
	7	194	25·25	7·87	33·12	4·85	2·03	6·88	·85	·41	1·26	41·26
Total ...	...	1,485	15·09	5·16	20·25	4·13	1 66	5·79	·94	·57	1·41	27·45

APPENDIX B.

Table of Contents of Compartments—(continued).

Block.	Number of compartment.	Area valued in acres.	Number of Sál to the Acre.			Number of Sain to the Acre.			Number of Chir to the Acre.			Total of all three species per acres.
			III. and IV. Class.	I. and II. Class.	Total.	III. and IV. Class.	I. and II. Class.	Total.	III. and IV. Class.	I. and II. Class.	Total.	
XXIV.—Gaunia Rau ...	1	200	22·81	6·14	28·95	7·44	4·99	12·43	·08	·05	·13	51·41
	2	86	18·69	5·29	23·98	9·13	3·54	12·67	·05	·02	·07	36·72
	3	243	10·74	4·69	15·43	3·98	2·17	6·15	·02	...	·02	21·60
	4	113	15·59	9·08	24·67	1·12	1·74	2·86	...	...	...	27 53
	5	101	14·43	6·28	20·71	3·53	2·58	6·11	·09	·04	·13	27·05
	6	133	12·62	4·13	16·75	5·03	1·48	6·51	2·42	·45	2·87	26·13
	7	193	2·48	2·37	4·85	3·82	·30	4·12	·57	·45	1·02	9·99
	8	139	10·00	2·58	12·58	2·89	·68	3·57	2·29	·61	2·90	19·05
	9	74	4·41	5·33	9·74	·79	·29	1·08	2·66	·89	3·55	14·37
	10	225	23·13	3·76	26·89	4·35	1·36	5·76	1·00	·33	1·33	33·93
	11	164	37·70	9·05	46·75	2·79	1·42	4·21	·37	·08	·45	51·41
	12	151	27·11	7·05	34·16	4·71	1·63	6·34	·11	·11	·22	46·72
	13	169	11·97	5·35	17·32	4·78	4·02	8·80	1·59	1·05	2·64	28·76
Total ...	...	1,994	16·83	5·44	22·27	3·96	1·90	5·86	·78	·35	1·13	29·26
XXV.—Chila ...	1	164	13·36	3·53	16·89	5·18	2·1	7·28	·39	1·58	1·97	26·14
	2	229	10·07	5·63	15·70	4·51	2·2	6·71	1·66	·77	2·43	24·84
	3	333	10·03	3·50	13·83	3·77	1·54	5·31	·78	·33	1·11	20·25
	4	209	29·32	3·80	33·12	5·41	2·27	7·68	2·50	2·07	4·57	45·37
	5	206	4·65	1·52	6·27	2·36	·51	2·87	4·95	4·07	9·02	18·16
	6	208	22·93	3·96	26·89	6·69	2·01	8·70	1·96	1·79	3·75	39·34
	7	229	15·54	6·25	21·79	2·96	1·44	4·40	1·29	·64	1·93	28·12
	8	204	9·72	4·01	13·73	4·50	1·37	5·87	2·13	·98	3·11	22·71
	9	275	17·43	5·00	22·43	5·10	1·95	7·05	3·47	1·66	5·83	35·31
Total ...	...	2,057	14·95	4·18	19·03	4·4	1·77	6·17	1·06	·96	2·62	27·82
Kholgarh S. ...	1	251	18·23	5·02	23·25	6·16	2·05	8·21	·89	·50	1·39	32·85
	2	211	6·42	2·30	8·72	1·16	·34	1·50	1·62	·53	2·15	12·37
	3	250	2·57	1·26	3·83	·18	·11	·29	·12	·14	·26	4·38
	4	203	6·73	2·15	8·88	3·98	1·62	5·60	4·44	2·24	6·68	21·16
	5	272	6·97	2·07	9·04	4·89	1·54	6·43	3·85	1·92	5·77	21·24
	6	191	8·15	2·12	10·27	4·20	·96	5·16	7·06	2·70	9·76	25·19
	7	225	35·19	3·92	39.11	6·02	1·78	7·80	2·72	1·60	4·40	51·31
	8	140	6·26	1·66	7.92	3·45	·10	4·45	3·32	1·40	4·72	17·09
	9	295	12·57	3·14	15·71	·87	·34	1·21	2·42	1·69	4·11	20·03
	10	304	11·35	3·53	14·88	2·58	1·15	3 73	2·49	2·15	4·64	23·25
Total ...	...	2,342	12·21	2·81	15·02	3·27	1·09	4·36	2·75	1·06	3·81	23·19
Kholgarh N, ...	1	108	17·80	4·55	22·35	6·43	2·31	8·74	1·22	·66	1·88	32·97
	2	153	17·62	6·90	24·52	3·14	1·94	5·08	·28	·31	·59	30·19
	3	234	16·02	2·37	18·39	1·00	·37	1·37	·05	·02	·07	19·83
	4	95	9·62	2·56	12·18	1·60	·56	2·16	·03	·04	·07	14·41
	5	88	21·62	4·36	25·98	1·71	·44	2·15	·70	·42	1·12	29·25
	6	233	18·43	2·30	20·73	3·15	·68	3·83	·05	·02	·07	24·63
	7	244	17·91	2·23	20·14	2·35	·70	3·05	·08	·06	·14	23 33
	8	91	41·54	6·37	47·91	1·39	·62	2·01	...	·05	·05	49·97
	9	140	31·92	4·55	36·47	1·57	·38	1·95	...	·03	·03	38·45
	10	113	9·03	1·69	10·72	·66	·14	·80	...	...	...	11·52
	11	88	23·14	2·94	26·08	1·62	·13	1·75	·02	·02	·04	27·87
	12	152	23·87	4·60	28·47	1·09	·17	1·26	...	...	...	29·73
	13	197	5·04	6·39	11·43	·42	·16	·58	...	...	...	12·01
	14	132	12·29	2·56	14·85	·53	·18	·71	...	...	..	15·56
	15	110	11·52	3·29	14·81	1·49	·48	1·97	...	·01	·01	16·79
	16	127	8·57	3·87	12·44	1·42	1·43	2·85	·03	·03	·06	15·35
	17	112	12·59	1·66	14·25	2·34	·50	2·84	·01	·01	·02	17·11
	18	158	7·92	3·49	11·41	·28	·27	·55	...	...	...	11·96
	19	137	11·50	3·43	14·93	1·32	·21	1·53	·14	·05	·19	16·65
	20	178	30·12	2·34	32·46	1·59	·38	1·97	·03	·01	·04	34·47
Total ...	...	2,890	17·11	2·46	19·57	1·83	·59	2·42	·11	·06	·17	22·16
Durga Pipal ...	1	181	7·92	4·25	12·17	1·94	·78	2·72	3·94	2·84	6·78	22·67
	2	221	19 50	4·81	24·31	2·45	1·45	4·20	4·33	3·23	7·56	36·07
	3	149	5·48	1·14	7·62	1·27	·32	1·59	1·53	1·12	2·65	11·86
	4	238	11·21	2·46	13·67	2·50	·36	2·86	7·14	3·14	10·28	26·81
	5	142	14·83	4·34	19·17	2·14	·74	2·88	9·42	4·16	13·58	35·63
	6	117	17·83	4·98	22·81	·43	·02	·45	1·62	·62	2·24	25·50
	7	132	35·20	5·46	40·66	1·49	·19	1·68	2·48	1·81	4·29	46·63
	8	234	42·61	7·82	50·43	4·22	·15	4·37	5·58	·42	6·00	60·80
	9	188	11·63	7·36	18·99	2·79	1·19	3·98	·77	·79	1·56	24·53
	10	234	38·13	8·76	46·13	2·73	1·44	4·17	2·36	·47	2.83	53·89
	11	158	39 51	5·18	44·69	1·39	·55	2·94	·60	·15	·75	48·38
Total ...	...	1,997	21·58	5·36	26·94	1·29	·71	2·00	3·78	1·77	5·55	34·38

APPENDIX B.

Table of Contents of Compartment—(concluded).

Block.	Number of compartment.	Area valued in acre.	Haldu.						
			IV. Class.	III Class.	*II. Class.*		*I. Class.*		Total.
					Sound.	Unsound.	Sound.	Unsound.	
Khamari	1	...	...	...	...	...	70	1	71
	2	...	...	...	...	...	71	...	71
	3	...	...	...	...	...	26	..	26
	4	...	...	...	...	...	9	...	9
	5	...	...	...	...	...	7	...	7
Total ...	...	...	...	...	...	...	183	1	184
Khapkot	1	...	...	...	...	...	19	...	19
	2	...	...	...	...	...	29	...	29
	3	...	...	...	...	...	95	10	105
Total ...	...	...	...	...	...	...	143	10	153
Bansa	1	...	...	...	...	...	57	...	57
	2	...	...	...	...	...	27	...	27
	3	...	...	...	...	...	22	...	22
	4	...	...	...	...	...	8	1	9
	5	...	...	...	...	...	153	...	153
Total ...	...	...	...	...	...	...	267	1	268
Naghan	1	...	...	...	...	...	141	...	141
	2	...	...	...	...	...	105	...	105
	3	...	...	...	...	...	69	...	69
	4	...	...	...	...	...	57	7	64
	5	...	...	...	...	...	28	...	28
Total ...	...	...	...	...	...	...	400	7	407
Dangaona	1	...	...	...	...	...	227	...	227
	2	...	...	...	...	..	142	...	142
	3	...	...	...	.	...	190	...	190
	4	...	...	...	...	...	84	32	116
	5	...	...	...	...	...	103	5	108
Total ...	...	...	...	...	...	...	746	37	783
Total for Barmdeo Forest ...	...	...	...	...	...	...	1,739	56	1,795

APPENDIX B.

Table of Contents of Blocks.

	Number of compartment	Area valued in acres.	SAL.							SAIN.							CHIR.						
			IV Class	III Class	II Class		I. Class.		Total.	IV. Class.	III. Class.	II. Class.		I. Class.		Total.	IV. Class	III. Class.	II. Class.		I Class.		Total.
					Sound	Unsound	Sound	Unsound				Sound.	Unsound.	Sound.	Unsound				Sound.	Unsound.	Sound.	Unsound.	
Jariakhal S	...	1,100	32,808	10,039	4,064	334	2,094	419	49,758	190	218	129	9	143	25	714	2	1	...	-	...		3
„ N.	...	...	...	...	...	...	...	Not valued		...	...	...	...	...	...	...	...	...	...	...	...	..	...
Jariakhal Forest	..	1,100	32,808	10,039	4,064	334	2,094	419	49,758	190	218	129	9	143	25	714	2	1	..				3
Khamari	..	610	22,263	4,275	622	54	178	28	27,420	311	390	302	7	445	12	1,467	...	...	...	...	.	..	...
Khapkot	...	433	13,623	6,368	959	197	128	91	21,366	1,036	586	264	10	221	7	2,124	6	36	25	...	5	..	72
Bansa	...	803	51,590	10,893	1,013	234	245	157	64,132	291	405	315	9	460	7	1,487	...	...	...	..	...	.	...
Naghan	..	686	28,685	5,378	686	51	154	50	35,004	335	276	235	5	326	11	1,188	...	...	...	...	..	.	..
Dangaona	...	825	10,642	830	108	13	20	12	11,625	53	36	19	...	99	...	207	...	...	..	...	...	..	...
Barmdeo reserve	... ..	3,357	126,803	27,744	3,388	549	725	338	159,547	2,026	1,693	1,135	31	1,551	37	6,473	6	36	25	...	5		72
Chim	...	6,227	261,442	58,858	10,950	5,562	2,992	3,854	343,658	15,151	10,428	4,816	593	3,924	517	35,429	285	359	241	...	100	...	985
Kalaunia E	...	3,121	98,307	24,782	5,005	1,170	2,202	826	132,292	10,694	6,278	2,802	303	2,033	290	22,400	758	1,075	671	..	369	..	2,873
„ W	... ..	1,574	19,014	10,106	3,312	654	1,461	489	35,036	4,568	3,719	1,535	190	1,024	122	11,158	433	322	315	...	242	...	1,312
Dula Gad	... ...	4,940	215,951	48,476	7,458	3,183	1,558	2,546	279,172	10,576	7,186	3,284	507	2,777	491	24,821	181	197	143	...	47	...	568
Sarra N	... ...	4,129	96,291	39,675	11,159	2,662	4,293	1,856	156,036	7,833	4,133	2,037	250	1,878	256	16,387	1,541	1,317	468	..	123	...	3,449
Sarra S	... ...	2,977	20,183	13,084	5,606	1,140	3,103	878	43,994	5,793	3,957	2,018	194	1,136	132	13,230	4,273	4,892	3,501	...	1,847	81	14,594
Kalaunia Forests	... ...	22,977	711,188	194,981	43,490	14,371	15,709	10,449	990,188	54,615	35,701	16,492	2,037	12,772	1,808	123,425	7,471	8,162	5,339	..	2,728	81	23,781
Sunkheri	... ...							Not valued.															
Balot S	... ...	897	21,299	12,328	2,466	326	830	285	37,534	3,266	2,676	1,012	229	511	184	7,878	23	25	29	...	16	...	93
„ N	... ..	1,353	12,549	6,870	2,166	203	918	153	22,859	5,773	4,375	2,171	173	1,469	136	14,097	380	358	247	...	306	...	1,291
Silani	... ...	1,811	13,242	11,519	5,178	1,168	2,131	919	34,157	4,917	4,319	2,369	375	1,609	255	13,844	833	779	455	...	192	...	2,259
Khonani S	...	1,532	18,842	17,004	6,652	1,230	2,470	980	47,178	5,698	3,976	1,692	194	967	157	12,684	651	754	409	..	165	...	1,979
„ N.	... ...	1,511	12,729	9,437	3,849	516	1,650	424	28,605	5,620	3,961	2,028	249	961	161	12,980	317	380	154	...	30	1	882
Rata Rau	... ...	811	10,242	6,347	2,003	145	736	130	19,603	2,379	1,834	880	127	533	103	5,856	501	557	596	...	920	...	2,574
Bhalsani	... ...	1,266	15,689	11,090	3,312	572	1,243	354	32,260	3,474	3,414	1,669	307	1,076	246	10,186	186	282	223	...	193	...	884
Aonla Khera N.	... ..	1,691	19,910	13,081	4,701	720	1,939	566	40,917	5,448	4,779	2,175	372	1,407	359	14,540	92	183	226	...	139	...	640
„ S.	... ...	1,485	12,009	10,405	4,278	760	2,017	614	30,083	3,075	3,070	1,340	211	773	149	8,618	707	691	527	...	321	1	2,248
Gaunia Rau	... ...	1,994	18,167	15,215	6,252	572	3,255	788	44,249	4,192	3,703	1,955	131	1,564	142	11,687	805	759	411	...	194	...	2,169
Chila	... ...	2,057	18,028	12,726	5,078	568	2,476	478	39,354	4,771	4,386	1,977	169	1,263	104	12,670	1,635	1,794	1,243	...	740	...	5,412

Kholgarh	S.	...	2,342	17,857	10,502	3,695	424	2,061	412	34,951	4,143	3,524	1,479	87	924	67	10,224	3,311	3,126	2,170	...	1,331	1	9,939
„		...	2,890	31,994	17,464	5,472	501	2,701	458	58,590	3,144	2,171	895	45	715	52	7,022	133	189	118	...	67	...	507
Durga Pipal	N.	...	1,997	27,416	15,680	6,108	858	3,008	742	53,812	2,876	1,802	766	78	527	52	6,101	3,640	3,920	2,262	...	1,278	...	11,103
Nindhaur		..	23,637	249,973	169,668	61,210	8,563	27,435	7,303	524,152	58,776	47,990	22,408	2,747	14,299	2,167	148,387	13,214	13,760	9,070	1	5,892	3	41,960
Working Circle		...	51,071	1,120,772	402,432	112,152	23,817	45,963	18,509	1,723,645	115,607	85,602	40,164	4,824	28,765	4,037	278,999	20,693	21,979	14,434	1	8,625	84	65,816
					Shisham.									*Khair.*							*Haldu.*			
Jariakhal	S.	...	...	17	7	1	1	...	...	26	508	99	8	...	...	...	615	...	...	...	...	...	...	...
Khamari		...	...	...	...	...	...	...	...	...	91	50	6	...	...	...	147	...	...	...	...	183	1	184
Khapkot		...	...	2,652	673	31	...	...	...	3,356	1,981	647	68	...	9	...	2,705	...	...	...	...	143	10	153
Bansa		...	...	445	105	3	...	2	...	555	239	81	3	...	...	...	323	...	...	...	...	267	1	268
Naghan		...	...	...	2	...	...	...	...	2	292	86	11	...	6	...	395	...	...	...	...	400	7	407
Dangaona		...	...	...	2	...	...	...	...	2	139	88	12	...	2	...	241	...	...	...	...	746	37	783
Barmdeo Reserve		...	...	3,097	782	34	...	2	...	3,915	2,742	952	100	...	17	...	3,811	...	...	...	...	1,739	56	1,795
Bhini		...	...	31	9	3	...	1	...	44	121	64	8	...	2	...	195	...	...	...	...	...	...	...
Kalaunia	E.	...	...	361	90	8	...	1	...	460	2,101	352	25	...	...	...	2,478	...	...	...	...	...	...	...
„	W.	...	...	354	99	39	5	7	2	506	1,288	245	16	...	3	...	1,552	...	...	...	...	...	...	...
Dula Gad		...	...	1,002	133	16	...	...	1	1,152	1,021	253	17	1	4	...	1,296	...	...	...	...	...	...	...
Sarra	N.	...	...	278	106	51	2	8	2	447	3,885	275	2	...	...	...	4,162	...	...	...	...	...	...	...
„	S.	...	...	612	335	100	3	14	7	1,071	5,233	316	3	3	...	...	5,555	...	...	...	...	...	...	...
Kalaunia Forests		...	...	2,638	772	217	10	31	12	3,680	13,649	1,505	71	4	9	...	15,238	...	...	...	...	...	...	...
Nindhaur Forests		...	...	4,212	10,911	388	...	40	...	15,551	10,911	1,123	94	...	18	...	12,104	...	...	...	...	...	...	...
Working Circle		...	...	9,964	12,472	640	11	73	12	23,172	27,810	3,679	273	4	44	...	31,810	...	...	...	...	...	...	...

APPENDIX C.

Measurements made to test the rate of growth of Sál, &c., in Kumaun.

(*a*).—Lachman Mandi half-acre plot.

No. on tree.	Class of tree.	Girth in March, 1881.	*Increase in girth between the date given and that on the preceding column.*								Average annual increase in girth	Remarks.
			Nov., 1881.	May, 1882.	Nov., 1882.	May, 1883.	Nov., 1883.	Mar., 1884.	Mar., 1885.	Mar., 1886.		
		Ft. In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
					Sál.							
11	II.	5 0·9	·6	...	·6	·1	·4	·3	·8	·5	·66	A free crown, straight and sound.
22	„	4 8·4	·1	·1	·8	...	·1	·5	·5	·6	·54	Ditto ditto.
No. of trees.	2	Average tree,	·35	·05	·7	·05	·25	·4	·65	·55	·60	
3	III.	4 4·3	·2	...	...	...	...	...	·1	·3	·12	Free but with parasites.
27	„	4 3·9	·2	...	. .	...	...	·5	...	...	·14	A free crown, but two branches injured.
35	„	4 3·6	·5	·2	·7	·1	·1	·3	·2	·7	·56	Free, straight and sound.
12	„	4 3 5	·7	·2	·3	·3	·4	·3	·6	·7	·70	Straight.
31	„	4 3·5	·5	...	·5	...	·3	·2	·5	·8	·56	Free but very crooked.
5	„	4 2·0	·3	·1	·4	·2	·3	·2	·5	·8	·56	Suppressed and very crooked.
36	„	4 0·2	·4	...	·4	...	...	·4	·3	·3	·36	Free straight with one hollow branch.
43	„	3 11·3	·2	·1	·1	·2	·1	...	...	·3	·20	Free straight.
55	„	3 11·0	·6	...	·6	·2	·4	·2	·6	·7	·66	Free but rather crooked.
6	„	3 6·2	·4	·2	·2	...	·7	·1	...	·6	·44	Straight and free, but touched by fire.
29	„	3 6·8	·3	...	·4	...	·4	·1	·3	·8	·56	Free and straight.
60	„	3 6·7	·6	·1	·6	·1	·3	·6	·6	·5	·68	Free but crooked.
64	„	3 6·7	·3	...	·5	...	·3	...	·6	·5	·44	Fairly straight but partially suppressed.
61	„	3 6·4	·1	·3	...	...	·2	...	...	...	·12	Crooked with parasites.
45	„	3 5·0	·6	...	·9	·3	·6	·2	·9	1·0	·90	Free, very crooked, one branch rotten.
33	„	3 4·5	·5	...	·3	·2	·3	·4	·2	·6	·50	Fairly straight and free.
51	„	3 4·1	·3	·1	·3	·1	·1	·2	·3	1·2	·52	Ditto ditto.
4	„	3 7·3	·3	...	·4	·1	·3	...	·4	...	·30	Suppressed towards south, one branch injured.
48	„	3 2·6	·4	...	·2	·2	...	·3	·7	·3	·42	Fairly free and straight.
65	„	3 0 3	1·0	...	·9	·2	·4	·5	·9	·8	·94	Straight and free.
No. of trees.	20	Average tree,	·44	·07	·41	·12	·27	·24	·41	·57	·51	
16	IV.	2 11·9	·6	...	·2	·3	·1	·5	·3	·7	·54	Free but crooked.
56	„	2 10·4	·1	...	·3	·2	...	..	·3	·2	·22	Suppressed and crooked.
58	„	2 10·0	·5	1·0	...	...	...	—·2	·1	·3	·34	
17	„	2 9·9	·4	...	·3	·3	·2	...	·8	...	·40	Very suppressed.
41	„	2 8·3	·4	·3	·6	...	·4	·6	1·0	·9	·84	Free but crooked.
38	„	2 7 1	·3	...	...	...	·1	...	·1	·1	·12	Crooked, one dead branch, fairly free.
59	„	2 6·7	·3	...	·2	...	·3	·1	·1	·1	·22	Suppressed and crooked,
62	„	2 6·7	·5	·2	·2	·4	·1	·4	·8	·4	·60	Crooked but fairly free.
57	„	2 6 7	·8	...	·5	·2	·5	·3	·7	1·0	·80	Straight.
34	„	2 4·5	·6	...	·3	·3	·3	·4	·7	·5	·62	Ditto and partially free.
1	„	2 2 5	·3	...	·2	·2	...	·5	·5	·4	·42	Crooked and suppressed.
52	„	2 1·3	...	.	...	...	...	...	...	...	...	Dead.
28	„	2 0·8	·6	...	·6	...	·1	·4	·5	·5	·54	Crooked and overshadowed.
2	„	2 0·7	·3	...	·3	·5	·4	·3	·8	·9	·70	Ditto ditto.
24	„	2 0·4	·4	...	·2	·1	...	·4	·6	·5	·44	Free and straight.
20	„	1 10·9	·8	...	...	...	...	...	...	·1	·18	Very crooked.
10	„	1 8·6	...	...	·4	...	...	...	·3	·2	·18	Straight but suppressed.
18	„	1 7·9	·3	·1	·1	...	...	·3	·3	·4	·30	Suppressed.
53	„	1 7·8	·4	...	...	...	·2	·3	·1	·3	·26	Ditto crooked and bark injured.
22	„	1 7·0	·7	...	·4	·1	...	·7	·6	·3	·56	Straight, but overshadowed.
63	„	1 6 9	...	...	...	...	. .	—·2	·1	·4	·06	Crooked and suppressed.
9	„	1 6·4	·1	...	...	...	·3	...	·4	·3	·22	Straight but suppressed.
42	„	1 6 1	·5	...	·2	·2	...	·4	·3	·3	·38	Suppressed.
25	„	1 5·9	·1	...	...	...	...	·3	...	·1	·10	Coppice shoot, crooked but free.
23	„	1 5·7	·8	...	·5	...	...	·7	·7	·5	·64	Straight but overshadowed.
14	„	1 5 5	1·0	...	·2	·1	·2	·5	·3	·9	·64	Crooked and suppressed.
54	„	1 5 0	·1	...	...	...	...	·2	·2	1·3	·36	Very suppressed.
7	„	1 3·8	·2	...	·1	·1	·3	·4	...	·2	·20	Suppressed.
50	„	1 3·8	·2	...	...	·2	·3	...	·2	·1	·20	Very crooked and suppressed.
39	„	1 3·2	·3	...	·3	...	·2	·2	·4	·4	·36	Crooked and suppressed.
30	„	1 1·9	·4	·1	·1	·2	·2	·3	·4	·6	·46	Suppressed.
32	„	1 1·8	·5	...	...	·2	...	...	·3	·8	·36	Very crooked and suppressed.
8	„	1 1·7	·3	...	...	...	...	...	...	...	·06	Crooked and suppressed.
26	„	1 1·3	·1	·1	...	...	...	·3	...	·2	·14	Small and suppressed.
40	„	1 1·0	·3	...	·1	·2	...	·4	·5	...	·30	Crooked and suppressed.
13	„	1 0·5	·1	...	·4	·1	·3	·2	·4	1·4	·58	Very suppressed.
15	„	0 11·5	...	...	...	...	...	—·3	·1	·5	·06	Very crooked and suppressed.
44	„	0 11·5	...	...	...	...	...	...	1·1	...	·22	Suppressed.
47	„	0 11·5	·5	...	...	·1	...	·1	1·5	·3	·50	Very suppressed.
37	„	0 10·9	·1	..	·2	·1	·1	·2	·3	·4	·28	Very crooked and suppressed.
19	„	0 9·8	·2	...	·2	·1	...	·5	·5	—·1	·28	Crooked and suppressed.
46	„	0 8·9	·4	...	·1	·1	...	·3	·3	·1	·26	Very suppressed.
49	„	0 7·7	·3	...	·1	·2	·2	·1	·3	·4	·32	Ditto and crooked.
No. of trees.	43	Average tree,	·34	·04	·17	·10	·11	·22	·39	·39	·35	

APPENDIX C.

Measurements made to test the rate of growth of sál, &c., in Kumaun—(continued).

No. on tree.	Class of trees.	Girth in March, 1881.	*Increase in girth between the date given and that in the preceding column.*								Average annual increase in girth	Remarks.
			Nov., 1881.	May, 1882.	Nov., 1882.	May, 1883.	Nov., 1883.	Mar., 1884.	Mar., 1885.	Mar., 1886.		
		Ft. In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
						Dhauri.						
3	IV.	2 3·0	·2	...	·2	...	...	...	·2	3·1	·74	
1	„	1 1·8	·2	...	...	·1	·2	...	·3	·1	·18	
2	„	0 8·0	·4	·2	·3	·1	...	...	·1	·6	·34	
No. of trees.	...	Average tree,	·26	·06	·16	·06	·06	...	·2	1·26	·42	
						Rohini.						
1	IV.	1 5 2	·3	...	·5	...	·1	·6	...	·4	·38	
2	„	0 11·5	1·0	...	·5	·5	...	...	·7	·3	·42	
No. of trees.	...	Average tree,	·65	...	·5	·25	·05	·3	·35	·35	·40	
						Chilla.						
1	III.	3 6·0	...	...	·5	·2	...	...	·1	...	·16	
					(c).—*Amtanola half-acre plot.*							
29	II.	5 5·4	1·0	...	2·0	·1	1·0	...	·7	1·5	1·26	Free, straight and sound.
61	„	5 4·9	1·4	...	·9	...	·1	·3	·9	1·4	1·00	Ditto ditto.
50	„	4 8·1	·6	...	·5	·1	1·0	—·7	·6	·5	·52	Straight, forked, one fork suppressed.
31	„	4 6·0	·6	·2	·8	...	1·1	—·2	1·0	·9	·88	Straight but suppressed.
No. of trees.	4	Average tree,	·9	·05	1·05	·05	·8	—·15	·8	1·06	·91	
21	III.	4 5·4	·5	...	·2	·1	·5	—·6	·5	·3	·30	Free, with one stem dry.
59	„	4 4·9	·2	...	·8	...	1·3	—·7	·4	·9	·58	Free, straight and sound.
4	„	4 4·7	·3	..	·4	·1	·4	—·5	·2	·3	·24	Two main branches, both crooked.
11	„	4 4·4	...	...	·6	·1	1·3	—·8	·5	·4	·42	Free, trunk injured up to 12 feet.
25	„	4 4·3	·5	·1	·1	...	·1	—·7	·4	·3	·16	Trunk injured.
27	„	4 3·7	·4	·1	...	·1	·2	—·4	·7	·5	·32	Straight, but partially suppressed.
1	„	4 2·9	·9	·4	1·3	...	1·4	—·5	·9	1·2	1·16	Free, straight and sound.
34	„	4 0·7	·7	·1	·6	...	·1	·3	·4	·5	·54	Trunk injured, crooked, fairly free.
16	„	4 0·6	·3	...	·5	...	...	—·3	·2	·3	·20	Partially suppressed and crooked.
10	„	4 0·1	...	...	1·1	...	·2	—·3	·7	...	·40	Free, straight, bark injured up to 4 feet.
45	„	3 11·1	·7	...	·7	...	·1	—·1	·3	·5	·44	Free and straight.
71	„	3 10·5	·2	...	·1	...	·2	—·2	·1	·1	·10	Crooked and hollow.
63	„	3 9·9	·6	...	·5	1·1	·2	·1	·5	·5	·70	Crooked from injury to the trunk.
23	„	3 8·6	·4	...	·3	·1	·2	—·1	·4	·3	·32	Suppressed, trunk injured up to 10 feet.
35	„	3 7·8	·9	...	·5	...	·2	—·1	·5	·7	·54	Straight.
39	„	3 7·6	·4	...	·4	...	·1	—·4	·4	...	·18	Straight and free.
8	„	3 7·0	·2	·1	·4	·1	...	—·4	·2	...	·12	Ditto.
70	„	3 6·9	·4	...	·3	·1	·1	—·7	·4	·2	·16	Ditto.
53	„	3 6·7	·2	...	·5	·1	·1	...	·6	·1	·32	Ditto.
14	„	3 6·2	·7	·1	1·3	...	1·6	—·2	1·1	1·2	1·16	Straight, partially suppressed.
38	„	3 4·3	·6	—·1	·9	·1	·2	—·1	·6	·7	·62	Straight and free.
51	„	3 3·6	·3	...	·2	...	·2	—·1	·3	·3	·24	Crooked and suppressed.
52	„	3 3·5	·2	...	1·1	·2	1·0	—·2	·3	·3	·58	Straight, partially suppressed.
33	„	3 2·7	·3	...	...	...	·3	—·8	Dead.	...	...	Dying from suppression.
No. of trees.	23	Average tree,	·29	·02	·39	·06	·3	—·21	·32	·3	·29	
22	IV.	2 11·	·2	...	·4	...	·4	—·4	·5	·2	·26	Suppressed and crooked.
24	„	2 10·6	·2	·1	·5	·1	·2	—·4	·2	·3	·30	Straight but suppressed.
64	„	2 10·3	·7	...	·1	·3	·6	—·4	·3	·6	·44	Sound but crooked.
13	„	2 10·0	·2	...	·1	·1	·1	—·9	Dead.	...	...	Dead.
42	„	2 9·9	·7	...	·9	...	·5	—·3	·5	·3	·52	Very crooked and suppressed.
65	„	2 9·9	·4	·1	·4	·2	·2	—·6	·4	·4	·30	Crooked and suppressed.
48	„	2 9·8	·4	...	·2	·1	...	—·2	·1	·3	·18	Crooked, very hollow and suppressed.
5	„	2 9·3	·5	...	·3	...	·5	—·1	·6	·6	·48	Crooked and suppressed.
44	„	2 9·1	·2	·1	·1	·1	·1	—·2	·3	·1	·16	Ditto ditto.
56	„	2 8·5	·6	·1	·7	·1	·6	—·1	·8	·8	·72	Straight and free.
26	„	2 8·2	·3	...	·1	·1	·3	—·5	...	·3	·12	Trunk injured, partially suppressed.
3	„	2 7·9	·2	...	·2	·1	·1	—·5	·2	Dead.	...	Straight slightly suppressed.
36	„	2 7·9	·1	...	·6	...	·2	—·2	·3	·4	·28	Ditto but crooked.
62	„	2 7·6	·2	...	·1	·1	·1	—·4	·3	·3	·14	Crooked and suppressed.
67	„	2 7·5	·5	...	·5	...	...	—·7	·1	·1	·10	Very crooked and suppressed.
43	„	2 6·8	·3	...	·3	·1	·2	—·2	·1	·4	·24	Crooked and suppressed.
40	„	2 6·7	·1	·2	·1	·1	...	—·2	·1	...	·08	Suppressed.
20	„	2 6·0	·5	..	·4	·1	·2	—·2	·4	·1	·30	Coppice shoot partially suppressed.

APPENDIX C.

Measurements made to test the rate of growth of **Sál**, *&c., in Kumaun.*—(continued).

No. on tree.	Class of tree.	Girth in March, 1881.	*Increase in girth between the date given and that in the preceding column.*								Average annual increase in girth.	Remarks.
			Nov., 1881.	May, 1882.	Nov., 1882.	May. 1883.	Nov., 1883.	Mar., 1884.	Mar., 1885.	Mar., 1886.		
		Ft. In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
							Sál.					
60	IV.	2 5·3	·4	...	·5	·2	·2	—·5	·2	...	·2(	Crooked and suppressed.
19	„	2 4·3	·4	...	·4	·1	·3	—·1	·6	·4	·4:	Free but crooked.
12	„	2 4·2	·6	...	·8	...	...	...	·5	·2	·4:	Straight, but much suppressed.
58	„	2 3·7	·2	...	·1	·1	...	—·1	—·2	·2	·06	Crooked and suppressed.
28	„	2 3·2	·5	...	·1	·2	·1	—·4	·3	·3	·22	Ditto ditto.
57	„	2 1·9	·3	·3	·2	·1	·2	—·5	·3	·1	·20	Straight but suppressed.
18	„	2 0·8	·6	·1	·7	...	·3	...	·3	·2	·44	Crooked and suppressed.
69	„	2 0·1	·4	...	·3	·1	·1	—·7	·2	·4	·16	Straight and free.
49	„	1 11·3	·2	...	...	...	·2	—·2	·2	...	·08	Much suppressed.
54	„	1 10·9	·3	·2	...	·1	·2	—·5	·5	...	·16	Crooked and suppressed.
37	„	1 10·2	·6	...	...	...	·1	—·3	·1	·2	·14	Ditto ditto.
6	„	1 10·1	·6	·2	·3	...	·3	...	·3	·5	·44	Ditto ditto.
7	„	1 9·5	·3	...	·3	...	·5	—·1	·1	·2	·26	Ditto ditto.
46	„	1 8·2	·3	...	·3	·1	·1	—·2	·4	·1	·22	Suppressed.
9	„	1 7·1	·5	...	·2	·1	·3	—·5	·5	·3	·48	Straight, but suppressed.
68	„	1 7·1	·6	...	·2	·1	·1	—·1	·3	·4	·26	Crooked and suppressed.
17	„	1 6·5	·2	·1	...	...	·1	—·4	·1	...	·02	Crooked and much suppressed.
32	„	1 6·2	·3	·1	·3	·1	...	...	...	·2	·20	Crooked and suppressed.
55	„	1 5·9	·1	·2	·1	·1	...	—·2	·1	·1	·10	Ditto ditto.
47	„	1 5·1	·4	...	·1	·1	...	—·2	...	...	·08	Very crooked and suppressed.
66	„	1 5·0	...	·2	·4	...	·2	—·3	·3	·2	·20	Suppressed, forked at 5 feet from ground.
15	„	1 4·3	·1	·1	·1	...	·5	—·6	·4	·4	·20	Crooked and suppressed.
No. of trees.	38	Average tree,	·36	·05	·29	·07	·21	—·25	·28	·24	·25	
							Mowa.					
30	IV.	2 0·2	·2	...	...	·1	·1	—·2	—·1	·1	·04	Suppressed and crooked.
2	„	1 2·9	·2	·2	·1	·2	·2	—·2	·1	·2	·20	Suppressed.
							Dhauri.					
41	III.	3 0·5	·3	·1	·2	...	...	—·1	—·2	2	·10	Crooked and hollow.
					(b).—*Summun Thapla half-acre plot.*							
27	I.	9 2·0	...	...	...	...	...	·5	...	...	·10	Hollow and dying.
54	II.	4 7·8	·3	...	1·0	...	·9	·1	·5	·5	·66	Free but very crooked.
30	„	4 7·3	·9	·2	·4	.	·6	·1	·4	·4	·60	Fairly straight but with a bad crown.
45	„	4 6·1	·7	1·0	...	...	...	—·1	...	...	·32	Free and straight.
No. of trees.	3	Average tree,	·63	·40	·46	...	·5	0·3	·3	·3	·52	
11	III.	4 1·4	·6	...	·6	·2	·2	·4	·8	·6	·68	Free but crooked.
39	„	4 1·0	1·1	...	...	·1	1·0	·9	·9	·1	1·00	Free and straight.
29	„	3 11·9	·7	·4	·1	...	·3	·4	·5	·9	·66	Straight but suppressed.
8	„	3 10·8	·2	·1	·3	·1	·4	·1	·1	·7	·40	Ditto free, perhaps unsound.
9	„	3 7·8	·8	...	·5	·1	·8	—·3	·7	·4	·60	Ditto but partially suppressed.
21	„	3 6·4	·2	...	·2	...	·1	·1	·3	...	·18	Ditto and free, trunk injured.
40	„	3 3·8	·7	·2	·5	·2	·2	·5	·9	·5	·74	Ditto ditto.
38	„	3 2·6	·5	...	·4	...	·1	·4	·1	·6	·42	Ditto ditto.
19	„	3 2·1	·9	...	·1	...	·5	·5	·6	·5	·80	Ditto ditto.
1	„	3 1·8	2·0	...	...	...	·2	·2	·6	1·1	·82	Ditto ditto.
7	„	3 1·0	·8	...	...	...	...	—·1	·4	·9	·40	Ditto ditto.
4	„	3 0·7	·6	·3	·9	·5	...	·5	·5	·7	·80	Ditto ditto.
47	„	3 0·2	·8	...	·4	·3	·4	·5	·7	·9	·80	Ditto ditto.
No. of trees.	13	Average tree,	·76	·08	·38	·12	·32	·31	·55	·68	·64	
5	IV.	2 10·8	·1	...	...	·2	...	...	·7	·5	·30	Straight and free; trunk injured.
22	„	2 9·6	·4	...	·2	·4	·1	—1·1	·5	·3	·34	Crooked and suppressed.
46	„	2 9·3	—·2	·9	·2	·4	...	·2	·4	·4	·46	Ditto and slightly suppressed.
51	„	2 8·0	·5	...	·5	...	·1	·4	·7	·5	·54	Fairly straight and free.
16	„	2 7·0	·5	·1	·5	...	·2	·2	·2	1·5	·64	Straight and free.
14	„	2 6·9	·7	...	·5	...	·5	·1	·7	·5	·60	Very crooked, but free.
10	„	2 6·1	·3	...	·1	·2	...	·1	...	...	·14	Straight, but suppressed.
49	„	2 6·0	...	...	·3	·2	·2	·3	·5	·5	·40	Ditto and free.
35	„	2 5·8	·7	...	·3	...	·2	·2	·3	·5	·44	Crooked and somewhat suppressed.
3	„	2 5·4	...	·1	·2	·1	·2	...	·1	·1	·16	Straight and partially suppressed.
52	„	2 5·4	...	·2	·4	...	·2	·6	...	·9	·46	Crooked below, straight above and free.
36	„	2 3·8	·3	·2	·7	...	·3	·2	...	·4	·42	Straight and partially free.
44	„	2 1·2	·1	...	·2	·2	...	—·2	·6	·1	·20	Crooked and suppressed.

APPENDIX C.

Measurements made to test the rate of growth of Sál, &c., in Kumaun—(concluded).

No. on tree.	Class of tree.	Girth in March, 1881.	*Increase in girth between the date given, and that in the preceding column.*								Average annual increase in girth.	Remarks.
			Nov., 1881.	May, 1882.	Nov., 1882.	May, 1883.	Nov., 1883.	Mar., 1884.	Mar., 1885.	Mar., 1886.		
		Ft. In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
2	IV.	2 1·1	·8	...	...	...	...	—·2	·3	·3	·24	Straight but suppressed.
31	„	1 11·9	·6	...	·5	·1	·3	·2	·4	·4	·50	Crooked but free.
26	„	1 9·0	·1	·1	·2	·6	...	—·3	...	·1	·34	Do. and suppressed.
50	„	1 7·5	...	·2	·3	·1	·3	·2	·5	·4	·40	Do. do.
12	„	1 7·1	·1	...	·2	...	·1	·2	·1	·2	·18	Straight but do.
33	„	1 7·0	·1	·1	·2	·2	·3	—·1	·7	·1	·32	Crooked do.
17	„	1 5·6	·9	...	...	...	·3	...	·2	·3	·34	Do. and do.
53	„	1 5·1	·3	·4	·5	·2	·2	·1	·7	·3	·54	Coppice shoot straight but suppressed.
24	„	1 4·9	·1	...	...	...	·1	·3	...	·1	·12	Crooked and suppressed.
6	„	1 4·7	·3	...	·1	...	...	·2	...	·4	·20	Straight but do.
28	„	1 4·7	·3	...	·2	·1	·2	·2	·1	·3	·28	Crooked and do.
42	„	1 4·7	·3	...	·2	...	...	...	·3	...	·16	Do. and do.
43	„	1 4·6	·4	...	...	·1	·1	·4	...	...	·20	Very suppressed.
20	„	1 4·2	·3	...	·2	...	·2	·2	·1	·2	·24	Do. do.
34	„	1 4·2	·3	...	·2	...	...	—·1	·6	—·2	·16	Crooked and suppressed.
56	„	1 4·0	·5	...	·2	·1	·1	·1	·2	·1	·26	Straight but do.
23	„	1 3·9	·1	...	·1	..	·1	·2	·3	...	·16	Crooked and do.
18	„	1 2·7	...	·1	·2	...	...	·2	...	...	·10	Ditto do.
48	„	1 2·7	—·4	·5	·1	·1	...	·2	·2	·1	·16	Suppressed.
37	„	1 1·7	·1	...	...	·1	...	—·1	·2	·4	·14	Crooked and do.
13	„	1 1·1	...	...	·1	...	...	·3	...	—·2	·04	Very crooked and suppressed.
32	„	1 1·1	·4	...	·2	...	...	·1	·2	·4	·26	Crooked and do.
25	„	1 0·3	...	·1	...	·1	...	·3	...	—·1	·08	Ditto do.
15	„	1 0·0	...	...	...	...	...	·2	·3	·1	·12	Rather crooked but free.
41	„	0 10·3	·2	...	...	...		...	...	·1	·06	Crooked and very suppressed.
55	„	0 9·0	...	·1	...	·1	...	...	·3	—·2	·06	Straight but suppressed.
No. of trees.	39	Average tree.	·26	·08	·20	·09	·13	·10	·27	·27	·28	
								Dhaura.				
4	IV.	2 10·1	...	·1	·1	·1	·1	...	·3	...	·14	
6	„	2 3·2	·1	...	...	...	...	...	·2	—·5	—·04	
5	„	1 10·1	1·0	·3	·4	·1	·1	...	·4	·6	·58	
3	„	1 0·2	·3		·5	·1	...	...	·2	·5	·32	
2	„	0 11·3	·2	...	...	...	·1	...	·2	·2	·14	
1	„	0 9·6	·4	...	·4	·1	·3	...	·5	·2	·38	
No. of trees.	6	Average tree.	·33	·07	·23	·07	·1	...	·3	·17	·25	
								Rauni.				
2	IV.	2 0·4	1·1	...	·5	...	·2	...	·3	·2	·46	
5	„	1 7·8	·7	...	·3	·1	·1	...	·7	...	·38	
4	„	1 4·4	...	·2	·6	·3	...	...	...	·2	·26	
3	„	1 3·2	·3	...	...	...	...	...	·2	·4	·18	
1	„	1 2·1	1·4	·1	1·4	...	·2	...	1·0	1·0	1·02	
No. of trees.	5	Average tree,	·7	·06	·56	·08	·1	...	·44	·36	·46	
								Indarjau.				
		1 8·3	·2	...	...	...	...	...	.	...	·04	
2	IV.	1 8·1	...	...	·1	...	·1	...	·1	·2	·02	
1	„											
	...	Average tree,	·1	...	·05	...	·05	...	·05	·1	·03	
								Chilla.				
1	IV.	3 2·2	·1	...	·1	...	...	...	·1	·1	·08	
								Harra.				
1	IV.	1 0·9	·1	...	·4	...	...	1·1	...	...	·32	

APPENDIX C.

Measurements made to test the rate of growth of Sál.

(b). Lachman Mandi two acre plot.

Number on tree.	Class of tree.	Girth in March, 1884.		Increase in girth between the dates given.		Average annual increase in girth.
				March, 1884-85.	March, 1885-86.	
		Feet.	Inches.	Inches.	Inches.	Inches.
13	II.	5	0·5	·5	1·3	·90
48	„	4	11·2	1·1	1·5	1·30
10	„	4	10·8	·8	·8	·80
93	„	4	10·7	·3	·8	·55
96	„	4	9·2	4·5	1·2	·75
37	„	4	7·5	·4	1·1	·75
70	„	4	7·0	·6	1·1	·86
95	„	4	6·5	1·0	·7	·85
No. of trees.	8	Average tree ...		·65	1·03	·84
80	III.	4	5·9	·8	1·2	1·00
34	„	4	5·7	·9	2·3	1·60
11	„	4	5·5	·6	1·1	·85
12	„	4	5·1	·4	·5	·45
2	„	4	5·0	·8	·6	·70
16	„	4	4·8	1·9	1.3	1·60
42	„	4	4·5	1·0	1.5	1·25
7	„	4	3·5	·8	1·7	1·25
23	„	4	3·0	1·3	2·4	1·85
77	„	4	3·0	·9	1·5	1·20
79	„	4	2·7	·9	1·1	1·00
9	„	4	1·2	·3	1·2	·75
71	„	4	0·5	1·0	1·0	1·00
27	„	3	11·4	·3	2·0	1·15
68	„	3	11·2	1·1	1·4	1·25
58	„	3	10·5	·8	1·3	1·05
78	„	3	10·2	·8	1·2	1·00
61	„	3	9·7	·8	1·3	1·05
56	„	3	9·5	·8	1·6	1·20
22	„	3	9·4	·9	1·3	1·10
54	„	3	9·2	1·1	1·2	1·15
88	„	3	9·2	·8	1·1	·95
60	„	3	9·0	·5	·9	·70
72	„	3	9·0	·8	1·3	1·05
31	„	3	8·7	·9	1·9	1·40
76	„	3	7·4	·9	·9	·90
15	„	3	6·8	·7	1·0	·85
17	„	3	6 8	·5	·9	·70
51	„	3	6·4	·4	·2	·30
52	„	3	5·3	1·1	1·7	1·40
62	„	3	4·3	1·0	1·1	1·05
91	„	3	4·1	1·0	1·6	1·30
38	„	3	3·5	·7	1·5	1·10
20	„	3	3·4	1·1	1·0	1·05
1	„	3	2·7	·6	1·0	·80
82	„	3	2·7	1·5	1·8	1·65
8	„	3	2·0	·6	1·1	8·5
35	„	3	1·8	1·1	1·1	1·10
4	„	3	1·7	1·1	1 1	1·10
18	„	3	1·7	1·3	1·1	1·20
97	„	3	0·9	·8	1·3	1·05
32	„	3	0·8	1·0	1·0	1·00
21	„	3	0·7	·7	·8	·75
28	„	3	0·3	1·0	1·3	1·15
24	„	3	0·2	·8	1·0	·90
85	„	3	0·2	1·1	1·4	1·25
57	„	3	0·0	·7	·9	·80
No. of trees.	47	Average tree ...		·87	1·25	1·06
99	IV.	2	11·5	·5	...	·25
47	„	2	10·8	·9	1·4	1·15
33	„	2	9·3	·9	·9	·90
46	„	2	8·6	·1	·5	·30
84	„	2	8·2	1·0	·9	·95
45	„	2	7·8	·9	1·2	1·05
89	„	2	7·5	1·4	1·8	1·60
98	„	2	7·1	1·0	1·5	1·25
100	„	2	6·5	1·0	1·3	1·15
69	„	2	6·3	1·1	1·2	1·15
53	„	2	6·1	·4	·4	·40
65	„	2	5·8	1·2	1·3	1·25
92	„	2	5·7	1·4	1·3	1·35
59	„	2	5·4	·4	1·0	·70
29	„	2	5·3	1·0	1·3	1·15

Number on tree.	Class of tree.	Girth in March, 1884.		Increase in girth between the dates given.		Average annual increase in girth.
				March, 1884-85.	March, 1885-86.	
		Feet.	Inches.	Inches.	Inches.	Inches.
112	IV.	2·	5·2	1·0	1·0	1·00
43	„	2·	4·7	1·0	1·2	1·10
3	„	2·	4·4	1·2	·8	1·00
64	„	2·	4·3	1·3	1·5	1·40
90	„	2·	3·7	·9	1·1	1·00
86	„	2·	3·2	1·3	1·3	1·30
30	„	2·	2·8	1·3	1·9	1·60
36	„	2·	2·5	1·1	1·1	1·10
74	„	2·	2·5	·9	·8	·85
40	„	2·	2·2	·2	1·1	·65
41	„	2·	2·2	1·0	·9	·95
19	„	2·	1·8	·9	1·1	1·00
6	„	2·	1·6	1·0	1·5	1·25
75	„	2·	1·5	·5	·7	·60
39	„	2·	0·8	1·0	·8	·90
49	„	2·	0·8	·2	·7	·45
25	„	2·	0·2	1·0	1·0	1·00
67	„	1·	11·8	·5	·2	·35
105	„	1	11·7	1·0	1·6	1·30
102	„	1	11·5	1·0	1·0	1·00
111	„	1	10·8	...	·4	·20
73	„	1	10·2	·6	1·1	·85
14	„	1	10·0	·7	·8	·75
81	„	1	9·4	·4	·7	·55
83	„	1	9·1	·6	·3	·45
26	„	1	7·7	·7	·7	·70
106	„	1	7·7	·7	·9	·80
5	„	1	7·0	1·0	·8	·90
63	„	1	7·0	·5	·6	·55
44	„	1	6·9	1·0	1·3	1·15
101	„	1	6·9	·6	1·0	·80
107	„	1·	6·7	·7	·8	·75
87	„	1·	6·1	·9	·9	·90
66	„	1·	5·7	·8	·6	·70
94	„	1·	5·7	1·3	2·0	1·65
104	„	1·	5·7	1·4	1·2	1·30
103	„	1·	5·2	·5	1·2	·85
114	„	1·	5·1	·6	·7	·65
113	„	1·	4·3	·6	·8	·70
55	„	1·	3·9	·5	·1	·30
110	„	1·	3·6	1·1	...	·55
108	„	1·	2·2	1·0	·5	·75
109	„	1·	1·5	·5	·7	·60
50	„	0·	11·0	1·0	...	·50
No. of trees.	59	Average tree ...		·83	·94	·88

(b).—*Summun Thapla two acre plot.*

27	II.	5·	3·5	·6	·7	·65
113	„	5·	2·6	·5	1·6	1·95
105	„	5·	0·9	·4	·8	·6
55	„	5·	0·5	·6	·7	·65
19	„	4·	10 7	·7	·8	·75
21	„	4·	10·0	·1	1·1	·6
71	„	4·	8·5	·6	1·0	·80
18	„	4·	8·0	·2	5·0	·35
39	„	4·	8·0	·7	1·0	·85
76	„	4·	8·0	·6	1·1	·85
82	„	4·	7·6	·3	·5	·4
100	„	4·	6·8	·4	·6	·5
No. of trees.	12	Average tree ...		·47	·87	·67
49	III.	4·	5·7	·6	·7	6·5
52	„	4·	4·5	·7	1·5	1·10
25	„	4·	3·8	·5	·2	·15
107	„	4·	3·5	·8	·9	·85
26	„	4·	2·5	·3	·7	·50
87	„	4·	2·4	·9	1·4	1·15
36	„	4·	2·0	·3	·7	·50
13	„	4·	0·7	·5	1·2	·85
43	„	4·	0·1	·9	1·0	·95
88	„	4·	...	1·0	1·0	1·00
114	„	4·	...	·6	1·1	·85
53	„	3·	11·5	·4	·8	·60
65	„	3·	11·3	·7	1·1	·90

APPENDIX C.

Measurements made to the test rate of growth of Sál—(continued).

(*b*)—Sunmun Thapla two acre plot.

Number on tree.	Class of tree.	Girth in March, 1884.		*Increase in girth between the dates given.* March, 1884-85.	March, 1885-86.	Average annual increase in girth.
		Feet.	Inches.	Inches.	Inches.	Inches.
99	III.	3	10·8	...	·3	·15
32	„	3	10·4	·3	·4	·20
108	„	3	10·2	·2	1·2	·70
112	„	3	10·1	·7	·6	·65
38	„	3	9·5	1·4	·2	·80
86	„	3	9·4	·5	·7	·60
62	„	3	9·1	·7	1·2	·95
97	„	3	9·	·6	·8	·70
24	„	3	8·7	·2	·3	·25
69	„	3	8·7	·7	·9	·80
17	„	3	8·6	·7	1·4	1·05
5	„	3	8·5	·7	·7	·70
103	„	3	8·4	·8	·9	·85
56	„	3	7·7	·9	1·3	1·10
12	„	3	7·	·8	1·4	1·10
45	„	3	6·8	·5	·8	·65
67	„	3	6·8	·8	1·2	1·00
70	„	3	6·8	1·	·6	·80
48	„	3	5·7	·8	1·	·90
115	„	3	4·8	·7	·8	·75
102	„	3	4·5	·7	·6	·65
101	„	3	4·4	·1	...	·05
109	„	3	4·3	·8	1·	·90
74	„	3	4·2	·7	1·5	1·10
9	„	3	4·	·6	·6	·60
51	„	3	4·	·6	·2	·40
37	„	3	3·2	·7	·3	·50
55	„	3	3·	·4	·6	·50
44	„	3	3·	·6	·7	·65
68	„	3	2·8	·4	·9	·65
29	„	3	2·6	·6	·5	·55
66	„	3	2·5	·8	1·	·90
110	„	3	2·2	·6	·7	·65
15	„	3	2·	1·	·6	·80
47	„	3	1·7	·4	·5	·45
89	„	3	1·5	1·1	1·	1·05
93	„	3	1·5	1·1	1·3	1·20
8	„	3	1·4	·7	·5	·60
95	„	3	1·	·4	·8	·60
81	„	3	0·5	·4	·1	·25
No. of trees.	53	Average tree. ...		·64	·78	·71
	IV.					
84	„	2	11·8	·4	·6	·50
28	„	2	11·7	·3	·8	·55
1	„	2	9·5	·9	1·1	1·00
96	„	2	9·5	·8	·4	·60
4	„	2	9·3	1·2	1·	1·10
59	„	2	9·2	·7	·4	·55
79	„	2	9·2	·9	1·1	1·00
94	„	2	9·	·9	1·1	1·00
34	„	2	8·7	·7	·6	·65
54	„	2	8·7	·5	·7	·60
63	„	2	8·2	·9	·8	·85
72	„	2	8·2	·6	·9	·75
92	„	2	8·2	·4	·4	·40
42	„	2	7·8	·8	·8	·80
2	„	2	7·7	·9	1·	·95
91	„	2	7·6	·3	...	·15
106	„	2	7·5	·9	·9	·90
6	„	2	7·	·7	·9	·80
40	„	2	6·5	1·4	·3	·85
11	„	2	6·1	·6	·6	·60
98	„	2	6·	·3	·2	·25
7	„	2	5·7	1·5	1·9	1·70
14	„	2	5·5	·6	·6	·60
73	„	2	5·4	·7	·8	·75
50	„	2	5·	·1	·3	·20
111	„	2	5·	·2	·2	·20
3	„	2	4·7	·7	·9	·80
10	„	2	4·7	·5	·3	·40
64	„	2	4·5	·7	·6	·65
77	„	2	4·5	1·0	1·	1·00
20	„	2	3·5	·3	·2	·25
80	IV.	2	3·2	.3	·6	·70
90	„	2	2·7	·6	·6	·60
85	„	2	2·	·6	·5	·55
61	„	2	2·	·7	·7	·70
60	„	2	1·6	·4	·3	·35
33	„	2	1·5	·5	·8	·65
83	„	1	11·8	·5	...	·25
23	„	1	11·	·2	·3	·25
57	„	1	9·7	·5	·5	·50
31	„	1	9·5	·7	·3	·50
78	„	1	9·4	·9	1·	·95
16	„	1	8·8	'8	1·1	·95
46	„	1	7·7	·2	·6	·40
22	„	1	7·	·2	·5	·35
41	„	1	6·8	...	·8	·40
75	„	1	6·5	·3	·4	·35
30	„	1	5·2	·5	...	·25
58	„	1	1·8	·4	·1	·15
104	„	1	1·8	·7	...	·35
No. of trees.	50	Average tree ...		·62	·61	·61

(*c*).—*Amtanola two acre s plot.*

Number on tree.	Class of tree.	Girth in March, 1884.		*Increase in girth between the dates given.* March, 1884-85.	March, 1885-86.	Average annual increase in girth.
		Feet	Inches.	Inches.	Inches.	Inches.
58	II.	5	0·3	·1	1·3	·70
67	„	5	0·2	·5	·9	·70
100	„	5	0·	·5	·4	·45
32	„	4	11·8	1·2	1·7	1·45
97	„	4	11·5	1·5	1·9	1·70
70	„	4	10·4	1·0	1·3	1·15
29	„	4	10·1	1·1	1·8	1·45
64	„	4	8·4	·7	1·1	·90
24	„	4	8·	1·5	1·5	1·50
105	„	4	8·	·5	·5	·50
25	„	4	7·1	·9	1·3	1·10
57	„	4	7·	1·3	1·7	1·50
27	„	4	6·8	1·2	1·0	1·10
56	„	4	6·7	·1	·1	·10
16	„	4	6·4	·8	·9	·85
55	„	4	6·4	·5	·7	·60
36	„	4	6·2	1·0	1·4	1·20
23	„	4	6·1	·9	·9	·90
17	„	4	6·	·5	·9	·70
21	„	4	6·	1·2	1·1	1·1
No. of trees.	20	Average tree ...		·85	1·12	·98
33	III.	4	5·4	·8	1·1	·95
46	„	4	5·3	·8	1·2	1·00
7	„	4	5·	·1	·6	·35
108	„	4	4·6	...	1·3	·65
75	„	4	4·3	·8	·9	·85
47	„	4	4·1	1·1	1·3	1·20
72	„	4	4·	1·0	1·0	1·00
65	„	4	3·7	1·0	1·1	1·05
15	„	4	3·3	1·0	1·4	1·20
50	„	4	3·1	1·1	1·5	1·30
1	„	4	3·	·9	1·5	1·20
31	„	4	2·6	1·1	·9	1·00
73	„	4	2·6	·9	·9	·90
20	„	4	2·5	·9	1·2	1·05
34	„	4	2·5	·6	·6	·60
60	„	4	2·	·7	1·3	1·00
63	„	4	2·	·7	·2	·45
19	„	4	1·7	1·0	1·2	1·10
69	„	4	1·4	·4	·9	·65
101	„	4	1·3	·9	·9	·90
106	„	4	1·3	·9	1·1	1·00
77	„	4	1·2	1·0	1·3	1·15
86	„	4	1·0	0·5	1·4	·95
81	„	4	0·5	0·8	1·6	1·20
87	„	4	0·4	0·9	1·4	1·15
89	„	3	0·3	·8	1·0	·90
90	„	3	11·7	0·5	·2	·35

APPENDIX C.

Measurements made to test the rate of growth of Sál in Kumaun—(concluded).

(*c*) Amtanola two-acre plot.

Number on tree.	Class of tree.	Girth in March, 1884.		*Increase in girth between the dates given.*		Average annual increase in girth.	Number on tree.	Class of tree.	Girth in March, 1884.		*Increase in girth between the dates given.*		Average annual increase in girth.
				March, 1884-85.	March, 1885-86.						March, 1884-85.	March, 1885-86.	
		Feet.	Inches.	Inches.	Inches.	Inches.		III.	Feet.	Inches.	Inches.	Inches.	Inches.
11	III.	3	11·5	1·1	1·7	1·40	38	„	3	3·7	·8	1·3	1·05
103	„	3	11·5	1·0	1·5	1·25	54	„	3	3·7	·9	1·2	1·05
78	„	3	11·4	0·8	1·3	1·05	68	„	3	3·7	·6	·7	·65
26	„	3	11·3	1·1	1·1	1·10	110	„	3	3·7	·7	·9	·80
35	„	3	11·1	·7	·5	·60	13	„	3	2·8	·9	1·2	1·05
80	„	3	11·0	·5	·6	·55	104	„	3	2·7	·8	·9	·85
114	„	3	10·8	·4	·3	·35	92	„	3	2·5	·8	·8	·80
59	„	3	10·5	·2	·3	·25	48	„	3	2·4	·6	·6	·60
44	„	3	10·4	·8	1·2	1·00	94	„	3	2·1	·5	·7	·60
91	„	3	10 2	·9	1·2	1·05	82	„	3	1·5	·3	·5	·40
84	„	3	9·5	1·0	1·1	1·05	5	„	3	1·0	·6	1·4	1·00
8	„	3	9·4	·5	1·0	·75	14	„	3	1·0	·9	1·0	·95
71	„	3	9·3	·8	·9	·85	95	„	3	0·7	·8	·9	·85
6	„	3	9·2	·5	·4	·45	12	„	3	0·6	·7	·7	·70
49	„	3	8·7	·3	·3	·30	40	„	3	0·5	·5	·5	·50
112	„	3	8·7	1·1	1·3	1·20	107	„	3	0·5	1·2	1·6	1·40
41	„	3	8·6	1·2	·9	1·05	45	„	3	0·2	·8	·7	·75
113	„	3	8·6	1·1	1·2	1·15	62	„	3	0·1	·9	1·0	·95
66	„	3	8·	1·0	1·4	1·20	88	„	3	0·	·6	·9	·75
74	„	3	8·	1·0	1·0	1·00							
61	„	3	7·5	·9	·9	·90	No. of	83	...	...	·79	0·97	·88
22	„	3	7·2	1·1	1·1	1·10	trees.						
76	„	3	6·8	·6	·7	·65							
102	„	3	6·5	·8	1·0	·90	43	IV.	2	11·7	·8	1·0	·90
4	„	3	6·4	·8	1·2	1·00	52	„	2	11·	·4	·2	·30
10	„	3	6·3	·9	1·9	1·40	18	„	2	9·5	·3	·9	·65
111	„	3	6·1	·9	·9	·90	84	„	2	9·5	·5	·7	·60
33	„	3	5·5	·7	·7	·70	9	„	2	9·3	·9	1·3	1·10
83	„	3	5·5	·6	·9	·75	93	„	2	9·	·8	·9	·85
96	„	3	5·5	·5	·5	·50	51	„	2	8·	·5	·6	·55
98	„	3	4·8	·8	1·0	·90	3	„	2	4·7	·8	·6	·70
28	„	3	4 7	·7	1·1	·90	37	„	2	2·6	·5	1·0	·75
42	„	3	4·7	2·5	1·0	1·75	2	II.	1	10·	·5	·5	·50
79	„	3	4·7	·5	·5	·50	99	„	1	5·4	·4	·5	·45
39	„	3	4·6	·8	·8	·80							
109	„	3	4·5	—1	·1	·05	No. of	II.	...	...	·58	·74	·66
53	„	3	3·8	·8	·8	·80	trees.						

APPENDIX D.

Kumaun Division, price list for sawn Timber and Bamboos.

Number.	Kind.	Length in feet. From.	Length in feet. To.	Girth in inches. From.	Girth in inches. To.	Price per cubic foot. R. a. p.
	Dry Sál axed.	1	5	1	12	0 4 0
				13	18	0 4 6
				19	24	0 6 0
				25	30	0 6 0
				31	36	0 7 0
				37	54	0 8 0
				55	60	0 9 0
		6	15	13	18	0 6 6
				19	24	0 7 0
				25	30	0 8 0
				31	36	0 9 0
				37	42	0 9 6
				43	48	0 10 0
				49	54	0 10 6
				55	69	0 11 0
		16	45	13	18	0 7 0
				19	24	0 8 0
				25	30	0 9 0
				31	36	0 10 0
				37	42	0 10 6
				43	48	0 11 0
				49	54	0 12 0
				55	60	0 12 0
		6	45	1	12	0 5 0
		1	45	61	120	0 12 0

Kind.	Length in feet. From.	Length in feet. To.	Girth in inches. From.	Girth in inches. To.	Sál. Green. R. a. p.	Sál. Dry. R. a. p.	Sandan and Tún. Green. R. a. p.	Sandan and Tún. Dry. Rs. a. p.	Shisham. Green. R. a. p.	Shisham. Dry. Rs. a. p.	Haldu, Dhauri, Sain, Jaman, Bakli Khara, Siris, Kimu, Tendu. Green. R. a. p.	Haldu, Dhauri, Sain, Jaman, Bakli Khara, Siris, Kimu, Tendu. Dry. R. a. p.	Kokat. Green. R. a. p.	Kokat. Dry. R. a. p.
Sawn per c. ft.	1	7	13	18	0 10 0	From six annas to eight annas.	...	...	...	...	...	...	...	...
			19	22	0 12 0									
			23	52	0 14 0									
	8	18	13	18	0 12 0									
			19	22	0 14 0									
			23	52	1 2 0		...	...	...	...	...	...	...	...
	1	18	1	12	0 8 0									
Axed or sawn c. ft.	1	45	1	30	...	...	...	0 8 0	...	0 5 0	0 5 0	0 4 0	...	0 3 0
			31	120	...	...	...	0 8 0	...	0 6 0	0 5 0	0 4 0	...	0 3 0
Planks c. ft.	1	5	1	36	0 8 0	...	...	...	...	...	...	...	...	...
			37	40	0 10 0									
	6	7	1	36	0 10 0									
			37	40	0 12 0									
	8	18	1	36	0 12 0	...	...	...	...	...	...	2 0 3	...	...
			37	40	0 14 0									
Pattis planed c. ft	1	12	1	12	0 10 0	0 10 0	...	...	...	...	...	...	...	...
					...	...								
Goras c. ft.	1	18	1	40	1 4 0									
Slabs ...	Per running foot				0 0 4	0 0 4	...	...	...	...	...	...	...	...
Pegs each.	1	1½	1	8	0 0 2	0 0 2	...	...	0 0 2	0 0 2				
Blocks for combs per bullock per buffaloe	...	...	...	...	...	...	...	...	...	...	...	3 8 0	...	...
	...	...	...	...	...	...	...	...	...	...	...	4 0 0	...	...
	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Bamboos. Class.	Length.	Circumference.	Price. By land. Rs. a. p.	Price. By water. Rs. a. p.
I.	Any ...	Any ...	0 1 0 each,	0 1 3 each.
II.	To 20	Do. ...	0 0 6 „	0 0 6 „
III.	15′	Do. ...	15 0 0 per 100 score.	16 0 0 per 100 score.
IV.	12′	Do. ...	12 0 0 each,	13 0 0 each.
V.	10′	Do. ...	9 0 0 „	10 0 0 „
VI.	4′	Do. ...	4 0 0 „	5 0 0 „
VII. solid or nearly so.	6′	Do. ...	9 0 0 „	10 0 9 „
VIII.	12′	Do. ...	12 0 0 „	13 0 0 „
...	...	...	...	...
Ditto ...	...	...	...	...

RULE I.—In measuring the length of any bamboo *three inches* is the maximum excess which may be allowed.
II.—This classification is based salely on the length of the bamboo in all classes except Nos. 7 and 8.

APPENDIX D.

Kumaun Division price list for Round Timber.

No.	Kind.	*Length in feet.*		*Girth in inches.*		*Sál.*		*Sandan Tún.*		*Shisham.*		*Haldu, Dhauri, Sain, Jaman, Bakli, Khura, Kumu, Siris, Tendu.*		*Kokat.*		*Khair Amaltas Bel.*	*Semal.*	Remarks.
		From.	To.	From.	To.	Green.	Dry.	Green.	Dry.	Green.	Dry.	Green.	Dry.	Green.	Dry.	Dry.	Green or dry.	
				Rs.	Rs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs a. p.	
1	Ballis per balli. Any. Length.			1	6	0 0 2	0 0 1	...	Same as sál.	...	...	0 0 2	0 0 1	0 0 1	0 0 1	...	...	Girth of ballis to be measured at the butt
				7	9	0 0 4	0 0 3	...		...	...	0 0 3	0 0 2	0 0 2	0 0 2	...	...	
				10	12	0 1 0	0 0 9	...		...	...	0 0 9	0 0 6	0 0 4	0 0 3	...	...	Green ballis are not cut without special order.
				13	15	0 2 0	0 1 6	...		...	...	0 1 0	0 0 9	0 0 8	0 0 6	...	...	
				16	18	0 3 9	0 3 0	...		...	...	0 1 9	0 1 6	0 1 3	0 1 0	...	...	
				19	21	0 6 3	0 5 0	...		...	...	0 3 2	0 2 6	0 2 1	0 1 8	...	...	
				22	24	0 10 0	0 8 0	...		...	...	0 5 0	0 4 0	0 3 4	0 2 8	...	...	
				25	...	0 11 3	0 9 0	...		...	...	0 5 9	0 4 6	0 3 9	0 3 0	...	...	
				26	...	0 13 0	0 10 3	...		...	...	0 6 6	0 5 3	0 4 3	0 3 5	...	...	
				27	...	0 15 0	0 12 0	...		...	...	0 7 6	0 6 0	0 5 0	0 4 0	...	...	
				28	...	1 2 0	0 14 6	...		...	...	0 9 0	0 7 3	0 6 3	0 4 10	...	..	
				29	...	1 4 9	1 0 6	...		...	...	0 10 6	0 8 3	0 6 11	0 5 6	...	...	
				30	...	1 7 9	1 3 0	...		...	...	0 12 0	0 9 6	0 8 0	0 6 4	...	...	
2	Logs per cubic foot.	1	5	1	30	0 5 0	0 4 0	...	...	...	...	...	...	...	...	...	...	Girth of logs to be measured in centre of log
		...	...	31	36	0 6 3	0 5 0	...	...	...	...	...	...	...	...	...	...	
		...	...	37	42	0 7 6	0 6 0	...	...	...	...	...	...	...	...	...	...	
		...	...	43	54	0 8 9	0 7 0	...	...	...	...	...	...	...	...	...	...	
		...	...	55	120	0 10 0	0 8 0	...	...	...	...	...	...	...	...	...	...	Green Shisham, Sandan, Tun, &c, not cut without special order.
		6	45	26	30	0 6 3	0 5 0	...	...	...	...	...	...	...	...	...	...	
		...	...	31	36	0 7 6	0 6 0	...	...	...	...	...	...	...	...	...	...	
		...	...	37	42	0 10 0	0 8 0	...	...	...	...	...	...	...	...	...	...	
		...	...	43	54	0 11 3	0 9 0	...	...	...	...	...	...	...	...	...	...	
		...	...	55	120	0 12 6	0 10 0	...	...	...	...	...	...	...	...	...	...	
		1	45	1	30	...	...	...	0 5 0	...	0 4 0	0 4 0	0 3 0	...	0 2 0	0 4 0	0 1 0	
		...	...	31	120	...	...	...	0 5 0	...	0 4 0	0 4 0	0 3 0	...	0 2 0	0 4 0	0 1 0	

No. 281, dated Simla, the 30th April, 1887.

From—B. RIBBENTROP, ESQ., *Offg. Inspector-General of Forests to the Govt. of India,*

To—Secretary to Government, N-. W. P. and Oudh, Rev. (Forests) Department.

SIR,—I have the honor to forward, for submission to His Honor the Lieutenant-Governor, a working plan for the forests of the Nindhaur Hills Working Circle, in the Kumaun Division, by Mr. N. Hearle, Deputy Conservator, which has been sent to me for consideration by the Conservator of the Central Circle. A copy of a Note thereon, by the Assistant Inspector-General of Forests, is also forwarded.

2. I have considered the plan from a technical point of view, and see no reason why it should not be sanctioned as it stands, leaving the objections hereinafter mentioned—in case they are acknowledged by His Honor the Lieutenant-Governor to be deserving of attention—to be dealt with as occasion may require.

3. The valuation of the forest is all that can be desired, and the descriptive part of the working plan is, on the whole, excellent. No doubt the report would have been less bulky if the number of compartments had been reduced, but there is no practical objection to the system adopted, beyond the fact that it must have caused a good deal of additional labor. I am of opinion that in an irregular hill forest a description of quality, density, and reproduction by means of numbers or cyphers is open to objection, as being too theoretical and implying a precision which it is impossible for us to acquire in the present state of forestry in India. No doubt this is the system advocated in professional works, and is in Germany adopted in general practice ; but in European countries there is this difference to be noted, that the types corresponding to such figures have, from a very much more extended knowledge of each class of forest, come to be formulated and are generally recognized by Forest Officers. Under any circumstances, I would advocate that if numbers are used in future working plans, the scope of each number should be broader than that here given to it.

4. As regards the determination of the yield, the working plan is entirely on the safe side—too much so, I believe, since it makes the period for the removal of the available 1st class trees sufficiently long for all the 2nd class trees to become similarly mature. This seems hardly necessary, and a probable increase in the outturn should be kept in view. By ignoring the fact that a large proportion of the 2nd class trees must necessarily in irregular forests of this description be even now verging on maturity, and by considering the entire stock of these trees as not above 4′ 6″ in girth, we run the risk of growing a reserve of trees which have passed the age of their most vigorous growth.

5. From Chapter XI it would appear as if it were intended to return only once in 32 years to the portion of forest previously worked over. Under these circumstances the over-mature and deteriorating timber in the block to be worked last would remain in the forest for another 31 years. This can be corrected at any moment, but I would suggest that the possibility of such correction becoming advisable even during the first ten years should not be lost sight of. The entire absence of an area check is only admissible so long as the proposed outturn is kept as much below the possible yield of the forest as seems to be contemplated in the present plan. Any alterations in this respect would probably necessitate its introduction.

6. I beg to suggest that a programme of forest improvements be added to the present working plan. This can be done gradually by the Divisional Officer ; but I think it is as necessary to reduce these works to a system as it is in the more important particular of the annual fellings. I quite agree with Mr. Dansey in regard to the importance of creeper-cutting being effected in as short a time as possible ; and beg to recommend, for His Honor the Lieutenant-Governor's favourable considera-

tion, that the protection of the whole forest from fire should be undertaken at the earliest opportunity.

No. 282.

COPY forwarded to the Conservator of Forests, Central Circle, North-Western Provinces, for information, with reference to his letter No. 595, dated the 7th February last.

Note on Mr. Hearle's Working Plan of the Nindhaur Hills Working Circle by the Assistant Inspector-General of Forests and Superintendent of Working Plans.

IT is noticed that this is no *proposed* working plan, but one *approved* of by the Conservator, Mr. Bagshawe, and already, as such, adopted by him, and partially carried into practice. Under the circumstances, it is not well understood why a copy of this plan is submitted to the Inspector-General—presumably for information only.

2. Since I am personally well acquainted with the present forests, and in fact commenced the field work which has resulted in this working plan, I look upon myself as more than usually fitted to express an opinion on the subject.

3. The valuation of these forests was conducted throughout on the system introduced by myself, and my policy of counting *all* the trees of the more valuable species was also adhered to. Subject to an easy and very certain method of check, such as that established by me, I can readily understand that the valuation survey upon which this working plan rests is extremely accurate, and, as such, the plan itself deserving of more than ordinary confidence.

4. But when, *for this purpose of facile check*, I divided the ground into very small geographical sections, in which I was assisted by the nature of this hilly region, it was very far from my mind to make these sections or plots my future compartments. For purposes of survey this division was most necessary, but the compartments would, in all cases, have been formed by me of several of these plots ; the number of the latter going to constitute a compartment being made to depend on *extreme* differences in the stock, in the ground, &c., &c., and on the requirements of an easy control.

Mr. Hearle appears himself to be alive to the objections that necessarily occur to a division which has not only no sense in it, but takes away from the simplicity of the plan. With the description of all the plots in his possession, there should have been no difficulty in condensing the same into descriptions of corresponding compartments, and in constituting the latter on the lines previously explained.

5. The meaning of the division into blocks as effected by Mr. Hearle is not very apparent. His blocks should, I think, have been his compartments, and his forests should, in the same way, have been his blocks, *viz.* :—

(*a*) Jaria Khal.	(*d*) Kalaunia.
(*b*) Barmdeo.	(*e*) North Nindhaur.
(*c*) Chini.	(*f*) South ditto.

Descriptions are, however, given by him of both blocks and compartments, and these, set forth in tabular form, appear to me to be well-arranged ; although, without a much more intimate knowledge of the forest than I possess, I am, of course, not able to say whether they are *good* ones. But the situation of the so-called compartments is nowhere defined with the precision required, *viz.* :—

North	...	...	...	...	...	...	...
South	...	...	...	...	...	...	...
East	...	...	...	...	...	...	...
West	...	...	...	...	...	...	...

and I very much doubt whether anybody but Mr. Hearle himself, or the other officers connected with this plan, will be able to mark all these compartments on the (4 miles = 1 inch) maps of the locality that still remain to be made by the Forest Survey Branch.

6. The arrangement of the descriptions is a very handy one, but the latter are, nevertheless, not sufficiently detailed for these mountain regions to give us a correct notion of the forest in each case.

The whole of our working hinges on—

(i) the degree to which the ground is covered by trees where the forest is continuous in character;

(ii) the condition of the advance growth and of the reproduction of the superior species under the above circumstances.

In the present descriptions we have figures given us to denote the density of the stock, the reproduction, and the quality of the growth. In all cases these figures range from 1 to 10, the latter representing the maximum.

But since neither of these limits is based on anything real and tangible, they convey no meaning to us.

For instance, we are not told how many trees to the acre a density of 10 portends; what fashion of growth, what character of reproduction the same quantity is intended to denote.

Sometimes we read in the column of reproduction "sál," and we know that sál reproduction is referred to; elsewhere the word is omitted, and we are left to guess whether general reproduction is not here meant.

The same remark applies to quality. And in regard to density it is only surmised that the total stock on the ground is implied, and not the more valuable species only. It would be interesting to know here in what a quality of 9 differs from a quality of 10, and a reproduction of 6 from a reproduction of 7.

I would very much have preferred myself a good concise description of the stock containing all the necessary information under the one heading "Stock," and which should explain where trees are immediately removable and why; where not, and why not; and which should lead us, after its perusal, to at once understand the treatment prescribed for that compartment and demanded by it.

The description given of the blocks is much more to the purpose, but the treatment prescribed—and there is no block which will not demand a different treatment for its different parts; and certainly one block will often have to be treated very differently in all respects from another block—is even here confined to matters for which a prescription should have been superfluous (fire-protection for instance), or is vague, general, and indistinct.

7. In other respects all that portion of the plan which leads up to the working scheme and comprises chapters on the locality, the ground, the climate, the stock, past history, &c., &c., is admirable, being well arranged, well, written, and containing, in a concise form, all the information demanded. But I fail to see how Mr. Hearle arrives at the rainfall given by him in paragraph 23 for the working circle. The rainfall at Naini Tal—elevation 7,000 feet—averages 90 inches only, and I cannot believe that any portion of the Nindhaur valley receives 164 inches on an average, or even 120.

8. Coming now to the scheme of working itself, the principle followed is evidently a sound one, namely, to work these forests by the method of jardinage, and to extract the whole existing stock of mature marketable trees during a period of time calculated to be sufficient for an adequate number of the younger trees to enter within the limits of maturity.

9. But I think it extremely doubtful if Mr. Hearle can be considered justified in using, for the determination of this period, such data as those afforded by the five years' experiments referred to by him in paragraph 70 of his report. I have myself had to make these measurements periodically in Bahraich, and I am in a position to say that, for such a short period as five years, the results are unworthy of our consi-

deration. Owing to the fall of the bark I have often found trees much smaller at the end of the year than they were at the commencement. Nothing less than fifteen years will answer for an experiment of this nature. Let it also be mentioned that the rates of growth recorded by Mr. Hearle are either for trees standing outside the working circle, and where the conditions are not all the same, or away from that part of the district altogether.

10. The accuracy of the rotation selected by Mr. Hearle is questionable for other reasons than the above. He is probably right in considering a girth of 6 feet as representative of the average dimensions attained to by mature sál trees in the working circle ; but I cannot agree with him that the present stock of mature sál trees should be necessarily made to last until the whole lot of existing 2nd class trees of the same species shall have themselves become mature. I think there can be no doubt that the correct principle in a normally constituted forest—where trees of all ages are more or less evenly distributed over the ground—is to remove the crop of mature trees during a period which shall be sufficient, and neither more nor less, to allow of an equivalent number of the younger trees reaching maturity. Evidently by attending to this rule we do but endorse the grand precept of all scientific forest management—which is to *remove* the *annual yield.*

11. In the present instance we have a grand total of 64,472 1st class sál trees, and 135,969 2nd class trees ; roughly speaking, one 1st class tree to every two 2nd class trees. Of these 2nd class trees a certain number are already mature, and Mr. Hearle proposes to fell a total volume of the latter aggregating 160,000 cubic feet during his rotation. This quantity may be said to represent some 5,000 trees only. But evidently Mr. Hearle makes here some mistake. On these hilly grounds the proportion of mature 2nd class trees is considerable. We see from his statement that there are no less than 23,817 unsound 2nd class trees, half of which we can surely consider as over-mature trees. And of the sound 112,152 trees of the same class it is not too much to infer that 24,000 must be mature, although the report gives no information on this point.

12. Again, of the 64,472 1st class sál trees a considerable number must be immature and far below the dimensions of which they are capable. Sál trees in perfect vigour are found in these forests up to 7 feet 6 inches in girth.

Although no information is given us on this head it is not too much to suppose that of the 64,472 1st class sál trees some 12,000 trees are not yet mature. Making allowances for these facts, we deduce a total number of mature sál trees on the ground, sound and unsound, equal to 88,000 trees.

13. And against this number we have only 100,000 immature 2nd class trees, of which some 12,000 are unsound, and an additional 8,000 will probably die out, in the natural course of thinning, within the next 30 or 40 years, leaving a balance of 80,000.

14. On the other hand, the sál trees in the 1st class certainly include a large proportion of trees that have lived beyond what, under a more economical working, we should permit them to attain to. It is not too much to suppose that 20,000 trees are in this position (including two-thirds of the unsound ones). We must put this quantity down as abnormal, as representing a reserve of timber due to the absence of systematic working in previous years.

15. We have a right to exploit this reserve without making a corresponding allowance in the future. Such reserves are not to be recommended in the case of sál, which becomes hollow and useless after a certain age. Most of these trees are hollow.

16. Adopting the principle already enunciated in paragraph 10, it will be sufficient, therefore, if we fell the 88,000 mature sál trees now on the ground within the period required for their replacement, at the end of our rotation, by 68,000 trees also mature.

17. To meet this we have a present stock of 80,000 healthy immature 2nd class trees, all of which, according to Mr. Hearle's rates of growth, should be mature within a period of not more than 32 years. But if the whole of the 80,000 2nd class trees will be mature within a period of 32 years, it is not too much to expect, in the case of irregular forests of the present character, that it will not take more than 25 years for the much smaller quantity of 68,000 to achieve the same result.

18. In calculating the annual yield Mr. Hearle adopts the view entertained from personal experience by the Divisional Officer, that only half of the 1st class trees are available for export. Mr. Hearle's meaning is here not very clear. I interpret it to signify that physical reasons render the removal of the other half undesirable, or impossible. But I am much surprised that so large a proportion of the trees should be so situated. It did not strike me to be the case. And that the same should obtain with Sain is inconceivable, since it is not generally found growing on difficult ground, and we have no object in husbanding it for purposes of reproduction. It is not possible that half of the trees are intended to remain on account of a poor reproduction, because this last condition would, it is hoped, not prevail throughout the course of the long rotation. But, even if we do concur with Mr. Hearle in the preceding, the number of available mature sál trees should still be in excess of what he has given (see above, paragraphs 11 to 17); and this applies to his other species as well.

19. But assuming that physical obstacles militate permanently against the removal of more than half of the 1st class trees, we cannot shorten our rotation in a corresponding degree, because we have to allow for the same number of 2nd class trees becoming similarly unavailable.

20. It is difficult to understand how Mr. Hearle arrives at his calculations of the annual yield in volume. He makes an allowance of 40 cubic feet for every 1st class tree available, notwithstanding that a large proportion of these trees are hollow. It cannot be that he has included all the hollow trees under the "non-available;" because very many of them will be found to contain much valuable timber; and, in the form of canoes, hollow sál trees fetch occasionally as much as Rs 40 apiece. And the average mature 1st class sál tree in the working circle will, *when quite sound,* not exceed 40 cubic feet in the log.

In any case it would never do here to base our fellings on the volume: and when sylvicultural reasons demand it, we must not hesitate to cut down even such hollow sál trees as will fetch no corresponding return. The evil of all previous working in the North-Western Provinces—and probably everywhere else in India—is that all unsound trees have been left to stand, even when the conditions of reproduction or the state of the saplings below imperatively required that they should be at least cut down.

21. Mr. Hearle contents himself with prescribing the annual yield and giving a rough sketch of the area which should be capable of supplying this quantity during the next 10 years. There is no attempt at a "plan of operations" properly so called; hardly a hint at improvements of any kind or description.

22. Area check there is none, unless we choose to consider as sufficient for this purpose the results of the valuation survey itself, and the intelligent guidance by the same of successive divisional officers.

23. Evidently, in my opinion, this working circle should have been divided into blocks containing equal resources in 1st class sál trees, the number of these blocks being made equal to the number of years—say 10—which should elapse between two exploitations over the same locality.

24. Given 32 years as the proper rotation for this circle, I should—and this would be a very easy task where all the trees have been counted—have divided the total area into 10 blocks, containing the same number of 1st class sál trees, and I should have arranged for three exploitations of each block during the course of the

rotation, each such exploitation to include the annual yield only, and to comprise, in preference, only such trees as had reached their most valuable dimensions ; trees being freely abandoned which promised to grow vigorously for another 10 years, so long always as there was no difficulty in obtaining the proper number of trees, and that some cultural consideration did not demand the removal of such trees.

25. These very same cultural considerations should preclude the removal of all the mature sál trees in one operation ; should preclude half of them being allowed to stand to the end of so long a rotation ; whilst a regard for economy and a provision against the decay of the stock should demand the extension of our exploitations over the whole area within not less than 10 years. In the present instance this provision would imply the annual working of some 8 square miles of forest, and this is by no means excessive.

26. Over the whole of this tract lines of export are much required. There are occasional large blanks and in many places on the northern slopes the reproduction of sál requires to be assisted by weeding out inferior species For this reason also the exploitations will have to be carefully executed owing to the often isolated situation of the old sál trees and the absence of sal reproduction.

It would have been advantageous if the requirements of each compartment had in this way been carefully written down, and a regular course of improvements prescribed for the first ten years, if not for the whole rotation. Thinnings of sál poles have certainly been arranged for—see paragraphs 81 and 82—and this is much to be commended.

27. Even in the case of creepers, the *immediate* cutting down of which is a matter of the greatest importance and could be effected in a *couple of years* at a total outlay of Rs. 1,000, it is recommended that 32 years be occupied over the work. At least this is how I interpret paragraph 86 of the report.

28. It is surprising to learn from paragraph 85 that these valuable forests are not as yet entirely fire-protected. It is difficult to understand why it is recommended not to protect certain areas and why nothing definite is prescribed as regards other tracts.

E. P. DANSEY,
Asst. Inspector-General of Forests and Supt. of Working Plans.

10th March, 1887.

No. 97, dated Naini Tal, the 23rd May, 1887.

From—C. BAGSHAWE, ESQ., *Offg. Conservator of Forests, Central Circle,*

To—N. HEARLE, ESQ., *Dy. Consr. of Forests, Working-Plan Dn., School Circle.*

COPY of Inspector-General's No. 282, dated 30th April, 1887, and of this office No. 595, dated 7th February, 1887, forwarded for any notes he may wish to record.

2. Paragraph 5 of Inspector-General of Forests' No. 281 may be regarded as already provided for by the revision suggested nine years hence, but notes by Mr. Hearle on the point would be valuable.

3. A programme of forest improvements was considered during the past working season and will be made out in due course.

4. Enquires if Mr. Hearle wishes to make any further revision of the plan beyond the typographical corrections which he can make when the proofs go to him from Press for correction ; if so, begs he will return a copy of the working plan with the alterations, so that it may be sent to Press as soon as Government passes orders on the subject.

No. 49, dated Naini Tal, 19th July, 1887.

From —C. BAGSHAWE, ESQ., *Offg. Conservator of Forests, Central Circle,*

To—*The Secy. to Govt., N.-W. P. and Oudh, Rev.* (*Forests*) *Department.*

SIR,—With reference to the Inspector-General of Forests' No. 281, dated 30th April, 1887, to your address, I have the honor to submit a note by Mr. Hearle, which furnishes further information in connection with the various points in the plan for the Nindhaur Working Circle commented on in the memorandum by the Assistant Inspector-General of Forests and Superintendent of Working Plans, forwarded by the Inspector General of Forests with his proposals for the sanction of the working plan.

2. In forwarding this note I would state that I generally agree with Mr. Hearle's views as stated in his note, and hope that, as recommended by the Inspector-General, his plan will be sanctioned. With regard to the compartments I may note that soon after the North and South Nandhaur forests were divided into compartments the Divisional Officer was supplied by the Working Plan Branch with a map showing these compartments, and that from 1881-82 the yield of green timber has been recorded by compartments. Mr. Dansey's intention of revisiting these divisions was not then placed on record. The question of increasing the proposed outturn can be considered when the demand for timber nearly equals the present estimate of the annual yield. The average exports of the last four years have been only 45,565 cubic feet.

3. In accordance with the suggestion of the Inspector-General of Forests, I submit for the orders of Government a programme of forest improvements which it is advisable should be carried out during the next ten years in the Nindhaur Working Circle. The work prescribed is probably the maximum amount the short working season and the unhealthy climate will allow of being executed. If this is approved of it can be published with the working plan when sanctioned. The cost of creeper-cutting, as noted by Mr. Dansey (para. 27 of his memo), *viz.*, Rs. 1,000 for 57,000 acres, or 3·3 pies per acre, is not understood. The average cost in East Kumaun is 1 anna 3 pies per acre.

4. In connection with the publication of the working plan Mr Hearle suggests, and I strongly recommend, that the description of compartments should not be printed in the 100 copy edition of the working plan which will be brought out when the plan is sanctioned. This will save the printing of pages 38 to 87 of the working plan as now in hand. The descriptions of compartments are not of general interest, nor are they required by the ordinary reader, while four spare copies of the first issue now in this circle will fully suffice for the use of the Divisional Officers and for record for use by the Working Plan Officer in 1897 if the plan is then revised.

5 If the plan as now amended is sanctioned by Government, I would propose that the orders of Government, the recommendations of the Inspector-General, and the notes recorded by Messrs. Hearle and Dansey be printed and bound up with the copies of the working plan for use in this circle, as these papers will be required for reference in connection with the administration of the Nindhaur Working Circle.

6. A copy of Mr. Hearle's note and of the programme of work is being forwarded to the Inspector-General of Forests with this office No. 195, dated 19th July, 1887.

No. — dated 6th June, 1887.

From—N. HEARLE, ESQ., *Deputy Conservator of Forests, Working Plans Division,*

To—*The Conservator of Forests, Central Circle, Naini Tal.*

SIR,—In reply to your No. 97 of the 23rd ultimo, I have the honor to enclose a note on the Inspector-General's No. 281 of the 30th of April last, and to request that copies of the same may be sent to the Secretary to Government, North-Western

Provinces and Oudh, and to the Inspector-General, as the note in question contains my explanations regarding many points on which the original plan may not appear to be sufficiently clear.

It would be useful if the programme of forest improvement which is being drawn up could be printed with the plan as an addendum.

I desire to make no futher revision except that the paragraph relating to creeper-cutting might be altered in accordance with the views expressed in the enclosed note.

I do not know how many copies of the plan are to be printed, but would suggest for your consideration whether it is necessary to print all the descriptions of the compartments, or whether it would not answer the purpose to print, say, half a dozen of them as examples. I suppose both the offices of the Conservator and of the Kumaun Division have already printed copies, and if the publication of all these descriptions could be dispensed with, some saving would be effected. I would, however, retain all the descriptions of the blocks.

I think the enclosed note together with that of Mr. Dansey's and the Inspector-General's remarks should also be printed with the plan for the guidance of the officers who will hereafter have to do the revision.

NOTE ON THE INSPECTOR-GENERAL'S No. 281 OF THE 30TH APRIL, 1887.

Mr. Dansey's criticisms of the working plan for the Nindhaur Hill Working Circle.

I. *Para.* 4—I quite agree (*vide* para. 63 of the plan) that the number of compartments is excessive, but it seemed to me that it was at least contemplated to a certain extent by my predecessors to make their plots compartments ; in fact the Divisional Officer had, I believe, been furnished with a map of the Nindhaur valley itself in which the valuation survey plots were numbered as so many compartments, and in Mr Dansey's own working plan for a very similarly situated forest, " the North Patti Dún," the divisions are also very minute. As I myself spent only a few weeks in the forests finishing the work which had been going on for some years past, I was anxious, perhaps wrongly so, to give the descriptions drawn up by my predecessors in their own words with as few alterations as possible, and this anxiety, combined with the fact that I had no personal acquaintance with the greater portion of the forests, determined me not to attempt grouping the plots together.

II. *Para.* 5.—The division into blocks was not " effected" but simply "adopted " by me, as I have distinctly stated at the end of my para. 62 which reads thus :—" These blocks were made by my predecessors in the work with the exception of Sarra North, Sarra South, Kalaunia West and Dulagad."

If the Assistant Inspector-General had looked at the maps and tracings accompanying my plan, which are on the scale of four inches=1 mile, and not of four miles =1 inch as he has stated, he could not have failed to observe that the boundaries of all the compartments are carefully marked on them, and as the tracings are facsimiles of the maps which still remain to be printed, there will be no difficulty whatever in transferring the boundaries as shown on these tracings to the Forest Survey sheets. I wish to note that these maps are so accurate that I will guarantee that any one of my working plan jamadárs who has never seen the Nindhaur valley will with such maps in his hand mark off the compartments on the ground with the greatest accuracy. I therefore considered that a written description of the boundaries of each compartment, which after all would be drawn up mainly from the maps, would be superfluous and a mere waste of pen, ink, and paper. The compartments are usually basins of streams or the halves of such basins, and have well-marked ridges or streams as boundaries ; these are all most faithfully depicted on the maps, which therefore convey a far better idea of the boundaries than any written description, however long and detailed, could possibly do.

III. *Para.* 6.—The descriptions, as I have already explained, were mainly written by my predecessors: all I did was to tabulate them. Cases occur where under reproduction the word "sál" is sometimes used and sometimes omitted, but the manuscript which I received went into no further details : hence the ambiguity in certain instances.

IV. *Para.* 7.—The figures for the rainfall are given on the authority of Mr. S. A. Hill, Meteorological Reporter to the Government of the North-Western Provinces and Oudh, and I do not think they appear so improbable when we consider that even in the Dún at Bhogpur the average rainfall has been ascertained to be 157·7 inches.

V. *Para.* 9.—I am quite prepared to admit that the results of five years' measurements of sample plots are not trustworthy, but the Assistant Inspector-General will, I hope, remember that there were absolutely no other *data* available, and I therefore had to make the best of such as could be obtained or to wait ten years for the results of further measurements.

VI. *Para.* 10.—To *remove* the *annual yield* is, no doubt, a grand precept of scientific forestry, but in India there are often many important and overwhelming reasons which prevent it being carried out, and which must be duly weighed if it be considered undesirable to frame a purely theoretical working plan. For instance, there may be little or no demand for the produce; it may be impossible to determine the annual yield or that yield can only be determined with the greatest roughness, as the Assistant Inspector-General himself points out in his preceding para. to be the case in these forests. Then, again, there may be a demand for one kind of timber and not for another, or the demand may fluctuate excessively, and so forth.

VII. *Paras.* 11 *to* 17.—In these paras. Mr. Dansey enters into an elaborate calculation of the number of mature sál trees on the ground, based really on guess work only, and then using my rotation, which he has previously said was unreliable owing to insufficient *data*, he draws the conclusion that all the mature trees can be worked out within 25 years.

Mr. Dansey having himself conducted many of these valuation surveys must know that the khalasis who are employed on the work are incapable of distinguishing a sound mature tree from a sound immature tree, and that therefore it was impossible to make a distinction between the two classes during the enumeration. In fact, to select and mark mature 2nd class sál as apart from sound but immature trees of the same class is an operation of the greatest difficulty, and from the little experience I have had of work in sál forests I feel almost certain that if great latitude were allowed in the selection of such trees during the first rotation, especially in a forest where it may be said that the demand is mainly for timber of the best quality, very many fine immature 2nd class trees which should be left to form the future stock would be extracted, and that although we might not be bringing out more than the annual yield, nevertheless we should be endangering our future supply of 1st class timber. It must be recollected that the greater part of the working circle is now being opened out for the first time; that the annual yield cannot be determined with anything like the accuracy which would justify us in working up to the rough estimate which it is only possible to make, and that the greater part of the forests are not yet under fire-protection. Under these circumstances I believe in moderate working and in the simplest possible plan. I therefore believe it to be advisable for the next ten years, at the end of which we shall be in position to fix a more accurate rotation, to work the forests on the simple plan of making the 1st class trees last until the 2nd class become mature, only allowing a moderate number of mature trees of the latter class to be extracted. Mr. Dansey does not seem to have realized the fact which I have endeavoured to bring out in chapter VII, that the demand for produce from these forests is still limited and is affected by the outturn of the Nepal and Oudh forests, as well as by the greater unhealthiness of the locality, the difficulties of export, and the inferior quality

of the trees. I therefore regard the greater part of the unsound trees as unmarketable at present, and this being so, Mr. Dansey's reserve practically disappears.

VIII. *Para.* 18.—Mr. Dansey says that I concluded that only half of the 1st class trees were available for export from the personal experience of the Divisional Officer, and he should have added from the results of past working. Surely it would have been very unwise if after such a brief acquaintance with the forests I had regarded my individual judgment, provided that it differed from this conclusion, as superior to the reasons given above for its adoption. I must disagree with him about sain, as from my experience in the Bhabar this species is often found growing on difficult ground. Thus sain abounds all along the upper boundary of the Ganges Division on troublesome and often very precipitous places, *vide* para. 48 of the plan for that forest; and from para. 37 of the Nindhaur plan it will be seen that it grows in similar localities in the Kumaun forests, *vide* also descriptions of numerous compartments in the Chini, Kalaunia and Sarra blocks ; but even if the sain fellings are too restricted, the question is of no practical importance, as the demand is very much below the quantity fixed by me, 18,000 cubic feet per annum, the average annual outturn since 1881 having only been 2,754 cubic feet.

IX. *Para.* 20.—As explained above, most of the unsound trees are at present unmarketable, and they have therefore been included under "non-available" in the calculation of the annual yield in volume. I have explained how uncertain the demand is up to the present in these forests even for the better class of timber. I do not think any hollow sál trees have ever been exported for canoes, neither do I anticipate such a demand arising.

X. *Paras.* 21 *and* 26.—I acknowledge the justice of the criticism, but I wish it to be recollected that the greater portion of the forests was only known to me from the description of the compartments which Mr. Dansey himself states to be meagre, and I doubt whether any person with only these descriptions in his hand could draw up a proper scheme of improvements. For the portion of the forest with which I was acquainted I have provided for a course of improvement where I considered this necessary, *viz.*, thinning of sál poles in the Dulagad block. I was personally averse to the preparation of this plan just at the very end of the field work which had been dragging on for years, but have endeavoured to carry out my orders to the best of my ability.

XI. *Para.* 22.—In para. 78 of the plan the blocks to be worked during the next ten years are given, and this should be quite sufficient as an area check for the present, as it seems inadvisable to hamper the divisional officers by imposing any unnecessary restrictions.

XII. *Para.* 23.—Mr. Dansey has adopted the French system, *pur et simple*, for working irregular forests, without, it appears to me, making allowance for the very different conditions existing in the present case. In France the working circle varies from 500 to a few thousand acres ; most French foresters have never dreamt of a working circle nearly 60,000 acres in extent, or of a forest most of which has never been worked and where a demand, and that limited, exists only for one out of a number of species. I think, therefore, that although we should bear in mind the principles of forestry as enunciated in Europe and the general organization of the forests there, yet that we should not too slavishly adhere to modes of working which were framed for forests of smaller extent, composed of other trees and flourishing under a different climate.

I have explained in para. 78 of the plan that work would be going on in three or four blocks at the same time, and therefore if Mr. Dansey's proposals were adopted there would be timber operations in full swing over 24 to 32 square miles in one season, and with the present forest establishment proper supervision could not be exercised over such a large area.

A second disadvantage would be that the timber contractor would have to work over three times as much ground to obtain the same number of trees, and this would

most seriously check the present somewhat uncertain demand. A third and very important point is that the forests would have to be opened out in a third of the time proposed by me, which would have the effect of trebling much of the work of the divisional officer and his establishment, and also of trebling the cost of the export roads, &c., which would all have to be made within the shorter period. I do not consider that the extraction of $\frac{7}{10}$ths of a sál tree per acre in one operation is so very undesirable; but, on the whole, I believe that although Mr. Dansey's plan may be desirable from a sylvicultural point of view, yet that, local circumstances being considered, it is for the present impracticable.

I am quite alive to the fact that the present divisions of the forest are only temporary, but I do not think we shall be in a position to modify them with advantage until the ten years have elapsed, after which a revision has been provided for. Then with more accurate data the proper rotation can be fixed with greater certainty, and the working circle could then be divided into blocks, not containing equal resources in 1st class trees as Mr. Dansey desires, but with special regard to their productive capacity. For example, if his plan were followed the present blocks Kalaunia E., Kalaunia W. and the Dulagad combined would only be equal, as regards their resources, in 1st class trees to the Sarra North block, but the area of the Dulagad block alone is greater than that of Sarra North, and it contains more than double the number of young sál trees. Therefore, according to Mr. Dansey's plan, we should have to alter our blocks entirely at the end of each rotation; but, on the contrary, if they were chosen at the beginning with regard to their productive capacity they would have a permanance which is eminently desirable.

XIII. *Para.* 27.—It did not strike me that the climber question was of very great importance in these forests, climbers being scarcely ever mentioned in the description of the compartments in the Nindhaur valley itself, although they appear to be commoner in the Kalaunia. Mr. Dansey is, however, I think, perfectly right in desiring an alteration of my para. 86, and I would now suggest that this operation be taken up forest by forest, one forest a year, but that each compartment should be gone over again at the close of the timber operations in it, as I have already suggested.

XIV. *Para.* 28.—I cannot understand why anything more definite is required concerning fire-protection. The new areas recommended for protection were the remainder of the Nindhaur valley, the Dulagad and Barmdeo. I stated in para. 51 that no interior lines are required in the first forest, and the outer fire-lines would naturally follow the watershed lines, there being a bridle path along the ridge from Bhainsa Dhunga to Airideo, *vide* para. 57. For the Dulagad I have given in para. 85 the position of the two paths which will have to be made for its protection, whilst Barmdeo, being an isolated forest, all that is required will be fire-lines around its boundary. My proposals when carried out will nearly treble the area under fire-conservancy. If, however, it be possible to protect the entire area at once, it would of course be very advisable; but the Conservator is the best judge of its feasibility, and I cannot change my plan without his approval.

Remarks by the Inspector-General.

XV. *Para.* 4.—As previously explained, I believe my plan to be the safest until we have much more correct data to rely on for the determination of the rate of growth. It is quite possible, and I think by no means improbable, that the real time which it takes a 2nd class tree $4\frac{1}{2}$ feet in girth to enter the 1st class may be 40 years instead of 32, as the trees in the sample plots seem to be growing under more favorable conditions than those which exist over the greater portion of the working circle.

XVI. *Para.* 5.—I never contemplated making the 32 years' rotation a permanency: in fact the rotation will probably have to be modified at the end of ten years, and when the forests have once been worked through, an entirely new plan will have to be formed. Circumstances will doubtless have considerably altered, and it will probably be found possible with safety to return more frequently to the same point and to get rid of unsound trees. Practically, however, supposing the

present rotation to be maintained, there would be no necessity to allow over-mature timber to remain in the blocks to be worked last for another 30 or 31 years. These blocks will be those which at present contain but a small number of mature trees, *e. g.*, Dalagad, Chini, and Barmdeo, but which already contain a large quantity of advanced growth which may be expected to improve with fire-protection, so that when the time arrives to exploit them there will be no reason whatever, if they are all marketable, why all the mature sál should not be extracted in one operation.

PROGRAMME OF WORKS OF IMPROVEMENT TO BE CARRIED OUT IN THE NINDHAUR WORKING CIRCLE, 1887-1896.

I.—Fire-conservancy.

Protection up to 1886 extended over 10,107 acres in the Nindhaur forests. The following extensions are proposed :—

(1) The remainder of the Nindhaur forest excluding—

	Acres.
Durga Pipal, compartments 9, 10 and 11	580
Sunkheri	1,028
Balot North	1,067
„ South	1,918
Total ...	4,593

thus bringing the area up to 20,807 acres.

The estimated cost of protection is as follows :—

	Rs.
Outer line following the boundary of the North and South Nindhaur forest, 100 feet wide, original cost Rs. 676, maintenance 17 miles @ Rs. 30 per mile... ...	510
Inner lines—	
Valley line to allow of grass chaurs being burnt and roads guarded, 12 feet wide, 12 miles @ Rs. 7 per mile	84
On North—	
Asnigadh, 3 feet path to be cut to 5 feet, original cost Rs. 90 a mile, maintenance 3 miles @ Rs. 10 per mile	30
Gaunia Rau, 3 feet path to be cut to 5 feet, original cost Rs. 45, maintenance 1½ miles @ Rs. 10 per mile	15
Ditto 50′ fire-line, original cost Rs. 30, maintenance 1 mile @ Rs. 20 per mile...	20
On South—	
Shelbasi gad, 3 feet path to be widened to 5 feet, original cost Rs. 90, maintenance 3 miles @ Rs. 10 per mile	30
Loharkhan Parau-nauli nala, 3 feet path to be realigned and cut to 5 feet, original cost Rs. 100, maintenance 2 miles @ Rs. 10 per mile	20
Total maintenance per annum ...	709

Original cost, first year, Rs. 406 in excess of above.

(2) Kalaunia forest, Dulagad block, area 5,311 acres.

ESTIMATE OF COST.

Outer line—	
Following boundary of block, 100 feet wide, original cost Rs. 320, maintenance 7 miles @ Rs. 30 per mile	210
Ditto 6 feet wide, 6 miles @ Rs. 7 per mile...	42
Inner line—	
Dulagad, Airideo, path 5 feet wide, original cost Rs. 150, maintenance 3 miles @ Rs. 10 per mile	30
Total maintenance per annum ...	282

Original cost, first year, Rs. 230 in excess of above.

(3) Kalaunia and Nindhaur forest blocks.

	Acres.
Compartments 9, 10 and 11 of Durga Pipal	580
Half Sarra North	2,456
Sarra South	3,013
Total ...	6,049

ESTIMATE OF COST.

Outer line—

	Rs.
Durga Pipal *viâ* Gangolia Rau to outer boundary pillar No. 78, south of Kataulia village, 12 feet line and path, 3 miles @ Rs. 15 per mile...	45
Down Palkholi rauli, 100 feet line, original cost Rs. 100, maintenance 2 miles @ Rs. 30 per mile	60
Sarra nadi, 12 feet line and path, 2 miles @ Rs. 10 per mile	20
Simal Karaunidhar, 100 feet line, original cost Rs. 100, maintenance 2 miles @ Rs. 30 per mile	60
Main ridge Simal Karauni dhar to Loharkhan parau on Nindhaur outer line, 100 feet line, original cost Rs. 350, maintenance 7 miles @ Rs. 30 per mile	210

Inner lines—

North—*Nil.*

South—

	Rs.
Mota Loharkhan-ki-dhar, 50 feet line, original cost Rs. 45, maintenance 1½ miles @ Rs. 20 per mile	30
Total ...	425

Original cost, first year, Rs. 235 in excess of above.

(4) Kalaunia forest block—

	Acres.
Kalaunia East, excluding compartments 1 to 5	2,672
Kalaunia West	2,220
Total ...	4,892

ESTIMATE OF COST.

Outer lines—

	Rs.
Kalaunia West, boundary with Kutol to Airideo, 100 feet wide, original cost Rs. 150, maintenance 3 miles @ Rs. 30 per mile	90
Sarra nadi and Sajki dhar, 12 feet line and path, 5 miles @ Rs. 15 per mile ...	75
Eastern boundary of Kalaunia East, 50 feet line, original cost Rs. 300, maintenance 10 miles @ Rs. 20 per mile	200

Inner lines—*Nil.*

Total ...	365

Add original cost, first year, Rs. 160 in excess of above.

(5) Kalaunia forest block—

	Acres.
Chini block	7,640
Kalaunia East, compartments 1 to 5	756
Total ...	8,396

Estimate of cost will be framed later.

(6) Nindhaur forest—

	Acres.
Sunkheri	1,028
Balot North	1,067
„ South	1,918
Total ...	4,013

Estimate of cost will be framed later.

To summarise the preceding proposals—

I.—Areas of which cost is estimated.

		Acres.	Rs.
Area previously protected, Nindhaur forest		10,107	577 (actuals).
(1)	Extension, Nindhaur forest	10,700	709
(2)	„ Kalaunia forest	5,311	282
(3)	„ Nindhaur and Kalaunia	6,049	425
(4)	„ Kalaunia forest	4,892	365
	Total ...	37,059	2,358

It is not convenient to fix the time at which protection should be begun; probably extensions Nos. 1 and 2 begun in 1886-87 can be completed in 188 7-88; No.3 might be taken up in 1888-89, and No. 4 in 1889-90.

II.—Areas of which cost is not estimated.

		Acres.
(5)	Extension, Kalaunia and Chini forests	8,396
(6)	„ Nindhaur forest	4,013

These might be taken up as soon as protection in the first group is assured; the probable cost is Rs. 775.

Under this arrangement by 1896—49,468 acres, or 86 per cent. of the working circle, would be protected at an annual cost of about Rs. 4,444 (allowing for 77 fire watchers at Rs. 15 per season and Rs. 156 for miscellaneous expenditure), or 1 anna 5 pies per acre.

This programme leaves the following areas to be dealt with in company with the Ladya forest after the close of the first ten years' period:—

	Acres.
Jariakhal	2,315
Barmdeo	3,357
Kalaunia forest, half of Sarra North	2,456
Total ...	8,128

II.—Climber cutting.

Taking the forests in turn as they are noted below, or as they are protected from fire, the following work is proposed:—

Nindhaur forest.

	Acres.	Rs.
1887-88	5,350	412
1888-89	5,350	412
1889-90	5,350	412
1890-91	5,350	412
1892-93	4,013	314

Kalaunia forest, Dulagad block—

1887-88	2,500	195
1888-89	2,500	195

Kalaunia forest, excluding Dulagad—

1889-90	4,528	353
1890-91	4,528	353
1891-92	4,528	353

Chini forest—

1892-93	3,820	298
1893-94	3,820	298

The forests of the working circle are included in two ranges, and these proposals are made with the view of equalizing the work in each range. Difficulty in procuring labor and in supervision preclude more rapid advance. By this arrangement 51,924 acres will be cut over in 7 years for Rs. 3,300.

III.—Weeding out inferior species.

In the Nindhaur forest this is not at present a work of much urgency, as sál is holding its own and in many parts the forest is too open. As far as the strength of the establishments will admit the compartments felled in will be thinned over.

In the Dulagad block of the Kalaunia forest inferior species are, where necessary, removed in the course of the prescribed thinnings

IV.—Planting up blank areas.

This work cannot at present be taken in hand, and it will be well to defer operations until we can note the effects of protection from fire.

In the Nindhaur most of the blanks are in low-lying ground where frost in the winter and extreme heat in summer are inimical to planting operations.

V.—Communications, buildings, and other works.

(*a*)—Roads—

Nindhaur-Kalaunia road, 12 feet wide—

		Rs.
(1)	Durga Pipal-Kotal section, 7 miles at an estimate of Rs. 500 a mile ...	3,500
(2)	Kotal-Jubileeganj, section 7 miles estimate	13,000

Export and inspection bridle roads—

(1)	Durga Pipal *viâ* Katauli to Ladya river, 8 feet wide, 9 miles @ Rs. 30 per mile,	270
(2)	Kotal Airideo, 5 feet wide, 4 miles @ Rs. 20 per mile	80
(3)	Loharkhan parau *viâ* Barghat. Sot to submontane road, 5 feet wide, 8 miles @ Rs. 20 per mile	160
		Rs.
	Total original cost ...	17,010

Maintenance per annum—

14 miles @ Rs. 40 per mile		560
21 „ @ Rs. 5 per mile		105
	Total ...	665

A line of road from Barmdeo to open up the Jaria khal (and the Ladya forest) will be prospected for, a line cut and estimate prepared.

Temporary roads required for one or more season's work and charged to timber expenses (A. II) will be made as usual from the ordinary allotment. No annual distribution of the road work is made, as the execution of the work must depend on the annual grant obtained and also on the labor available.

(*b*)—Buildings—

		Rs.
1	2nd class rest house at Jubileeganj at the month of the Kalaunia nadi ...	2,000
2	3rd class houses at Durga Pipal and Kotal @ Rs. 1,200	2,400
3	Rangers' houses and subordinates' quarters at Aonla Khera, Kotal, and Jubileeganj @ Rs. 400	1,200
	Total ...	5,600

The above in addition to the existing buildings at Chorgallia, Aonla Khera, and Jaunla Sal will suffice for the ten years.

(*c*)—Other works—

		Rs.
Well at Jubileeganj, probable depth 50 feet		800

General—

The execution of this programme involves the following additional grants for work during the ten years :—

			Rs.
Fire-conservancy, 10 years from Rs. 1,000 to Rs. 4,400 say			23,000
Climber cutting			3,300
Road construction	17,000		
Maintenance	3,300		
		20,300	
Buildings			5,600
Wells			800
	Total ...		53,000

An annual grant of Rs. 5,300 will probably be the best method of providing for the work.

(Sd). C. BAGSHAWE,
Officiating Conservator.

No. $\frac{386F.}{657-3}$, dated Naini Tal, the 9th August, 1887.

From—T. W. HOLDERNESS, ESQ., *Secy. to Govt., N.-W. P. and Oudh, in the Revenue (Forests) Department,*

To—The Inspector-General of Forests to the Government of India.

SIR,—I am directed to acknowledge the receipt of the working plan of the Nindhaur Hills Kumaun Forests Division in the Central Circle and accompanying papers submitted with your letter No. 281, dated 30th April, 1887.

2. In reply I am to say that His Honor the Lieutenant-Governor and Chief Commissioner has, after perusing the papers submitted by you, been pleased to sanction the working plan in question for a period of ten years.

No. $\frac{387F.}{657-4}$ OF 1887.

COPY forwarded to the Conservator of Forests, Central Circle, for information, with reference to his letter No. 49, dated 19th July, 1887, with the remark that orders will subsequently issue regarding the programme of improvements, and that the Conservator's suggestions, in paragraphs 4 and 5 as regards the printing of the papers are approved.

No. $\frac{552F.}{657-7}$, dated Naini Tal, the 10th October, 1887.

From—T. W. HOLDERNESS, ESQ., *Secy. to Govt., N.-W. P. and Oudh in the Revenue (Forests) Department,*

To—The Consr. of Forests, Central Circle, N.-W. P. and Oudh.

SIR,—In continuation of the endorsement from this office No. $\frac{387}{657-4}$, dated 9th August, 1887, I am directed to forward a copy of a letter* from the Commissioner of the Kumaun Division regarding the working plan of the Nindhaur Hills, and to say that subject to the provisos contained in the Commissioner's letter, which are approved by Government, the programme of improvements submitted with your letter No. 49, dated 19th July, 1887, is sanctioned.

* No. $\frac{21}{XXIII-47}$, dated 4th October, 1887.

Copy of a letter No. $\frac{21}{XXII-47}$, *dated Naini Tal, the 4th October,* 1887, *from the Commissioner, Kumaun Division, to the Secretary to vernment, North-Western Provinces and Oudh, Revenue (Fore Department.*

IN reply to your No. $\frac{388F.}{657-5}$, dated 9th August last, I have the ho to state that there will be no hardship to the Bhábar tenantry in f protecting the Nindhaur valley forests excepting the Balot South, Bal North, Sunkheri blocks, and compartments 9, 10 and 11 in Durga Pip provided free access is allowed along roads and pathways to village moving up and down hill with their cattle.